Rock Products
With which is Incorporated CEMENT and ENGINEERING NEWS
Founded 1896

Volume XXXV | Chicago, August 13, 1932 | Numbe- 16

Operating Experience Under San Francisco's Mineral Aggregates Merger

Pacific Coast Aggregates, Inc., Combines Twelve Previous Independent Operations

By Spencer B. Lane
San Francisco, Calif.

PACIFIC COAST AGGREGATES, INC. is a California corporation with headquarters at 85 Second street, San Francisco. The company produces crushed rock, gravel and sand; operates plants distributed throughout northern and central California. Subsidiary companies handle the distribution of its products in San Francisco, East Bay Cities and Sacramento. Some sales are made from its plants direct to paving contractors, but most of its output is distributed through local dealers. The capacity of its combined plants is about 6,000,000 tons per year.

In 1930 twelve independent companies engaged in the rock and gravel industry merged to form Pacific Coast Aggregates, Inc. All plants and equipment of these companies, both owned and leased, came into the control of the new company. Pacific Coast Aggregates, Inc., immediately abandoned certain plants where there was wasteful competition. In this way plants which showed high operating costs, or other undesirable features, were eliminated. The company now has 16 plants, distributed as shown on the accompanying map. From these plants it supplies its products to the trade from Bakersfield in the south to Redding in the north. The table on the following page gives a list of these plants, their locations and their approximate daily capacity in tons.

In addtion to these plants, the company acquired a marine fleet from the merger. It is operating this fleet in San Francisco Bay and the tributary rivers. It also acquired distributing facilities in San Francisco, East Bay Cities, Sacramento and San José. Paci-

Editors' Note

IN SPITE of the fact that Pacific Coast Aggregates, Inc., is a merger formed under the boom conditions of 1930, it has justified itself, and the producers who went into it are probably far better off than if they had continued to operate individually under present conditions. That the industry is better off, of course, goes without saying.

Pacific Coast Aggregates, Inc., is particularly interesting as an operating organization because it produces and markets sand, gravel and crushed stone for nearly every industrial use except limestone for blast furnaces, etc. Its operations include practically every type of sand and gravel plant, cableway excavator, dragline, shovel and dredge. Its products include scientifically graded sand, glass sand, filter sand, etc., as well as graded coarse aggregate. At one plant gravel is crushed to make sand.

This short article is hardly sufficient to do justice to the operating details and problems, but it does give an excellent general picture of one of the most interesting and notable organizations in the mineral aggregate industry.—The Editors.

Distributing bins at Oakland

Plant C, Livermore Valley

LIST OF PLANTS OF PACIFIC COAST AGGREGATES, INC.

Designation	Location	Product	Capacity—8 hours
F	Oroville	Rock, gravel, sand	2000 tons
L	Fair Oaks	Rock, gravel, sand	3500 tons
W	Marysville	Sand	600 tons
O	Sacramento	Sand	600 tons
Q	River Rock	Rock, gravel, sand	2000 tons
A	Livermore Valley	Rock, gravel, sand	1500 tons
C	Livermore Valley	Rock, gravel, sand	3000 tons
D	Livermore Valley	Rock, gravel, sand	1500 tons
E	Niles	Rock, gravel, sand	1500 tons
U	Campbell	Rock, gravel, sand	600 tons
S	Coyote	Rock, gravel, sand	2000 tons
T	Vasona	Rock, gravel, sand	500 tons
H	Solo	Rock, gravel, sand	600 tons
I	Monterey	Sand	600 tons
K	Monterey	Sand	600 tons
G	Piedra	Quarry (rock)	3000 tons

fic Coast Aggregates, Inc., is operating four bunkers in San Francisco for delivery to independent dealers. The remainder of its distributing system in that city is being operated by a subsidiary, Golden Gate Atlas Co. The distributing facilities in East Bay Cities and in Sacramento are being operated by another subsidiary, Transit Concrete, Ltd. Both the Golden Gate Atlas Co. and Transit Concrete, Ltd., carry a full line of building materials and handle concrete delivered in mixer trucks in addition to acting as distributor for the products of the Pacific Coast Aggregates, Inc. The distributing facilities in San José have been leased to local dealers.

Plant Grouping

The 16 plants listed above fall readily into five groups. This division is made on the basis of the kind of material on which the plants operate rather than on the product.

GROUP I

There are two plants in this group: Oroville (*F*), and Fair Oaks, (*L*). Both of these plants operate on tailings left by gold dredges. This material presents peculiar difficulties not encountered in plants of the other groups. The Fair Oaks plant is described farther on.

GROUP II

There are two plants in this group: Sacramento, (*O*), and Marysville, (*W*). Both of these plants produce sand only. The plants are quite similar. The Sacramento plant is described farther on.

GROUP III

There are eight plants in this group: three in the Livermore Valley, (*A*), (*C*), (*D*); one at Niles, (*E*); one at Campbell, (*U*); one at Coyote, (*S*); one at Vasona, (*T*), and one at Solo, (*H*). All of the plants of this group operate in natural deposits of gravel. The Livermore Valley plant (*C*) is a good representative of this group. It is dscribed farther on. All plants of the group follow in a general way the operations at plant (*C*), although there are variations in details.

GROUP IV

There are two plants in this group: (*I*) and (*K*). Both of these plants are on the ocean beach at Monterey Bay. They produce sand only. They are described farther on.

GROUP V

There is only one plant in this group, the quarry at Piedra, (*G*). This is the only quarry operation of the company.

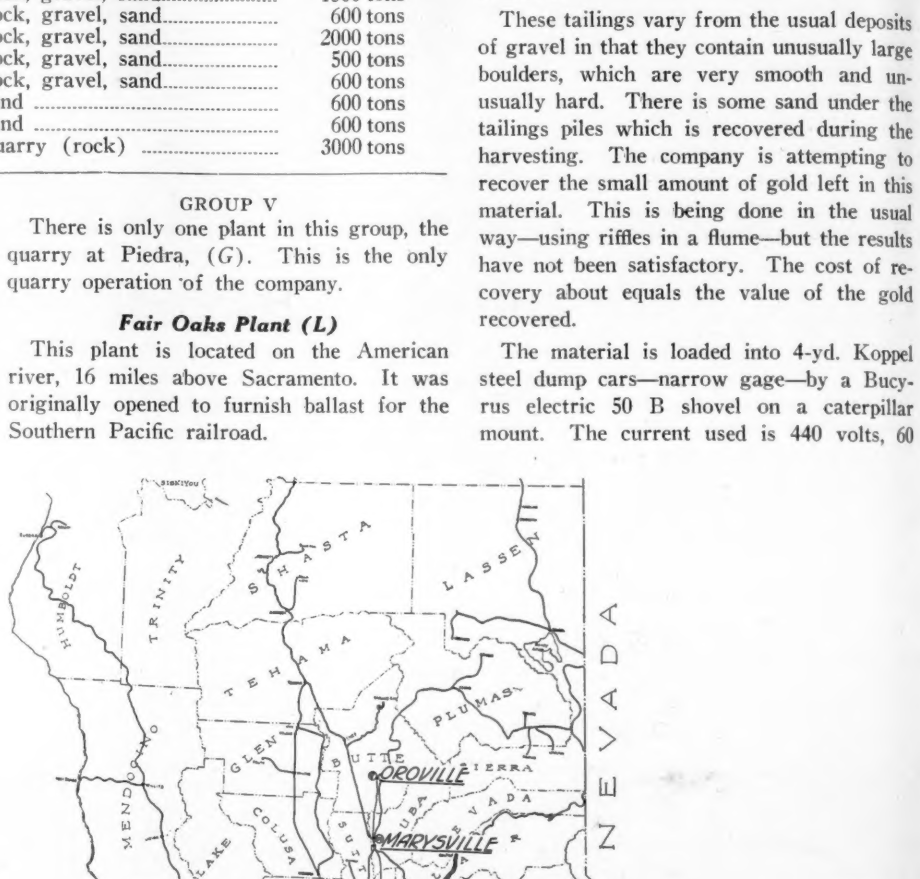
Fair Oaks Plant (L)

This plant is located on the American river, 16 miles above Sacramento. It was originally opened to furnish ballast for the Southern Pacific railroad.

The American river has produced considerable quantities of placer gold. The gravel deposits, which extend to a considerable distance beyond the present bed of the river, have been worked over by gold dredges. These dredges left great piles of tailings. This plant operates exclusively on these tailings, of which there are millions of tons available.

These tailings vary from the usual deposits of gravel in that they contain unusually large boulders, which are very smooth and unusually hard. There is some sand under the tailings piles which is recovered during the harvesting. The company is attempting to recover the small amount of gold left in this material. This is being done in the usual way—using riffles in a flume—but the results have not been satisfactory. The cost of recovery about equals the value of the gold recovered.

The material is loaded into 4-yd. Koppel steel dump cars—narrow gage—by a Bucyrus electric 50 B shovel on a caterpillar mount. The current used is 440 volts, 60



Map of central California, showing location of plants of Pacific Coast Aggregates, Inc.

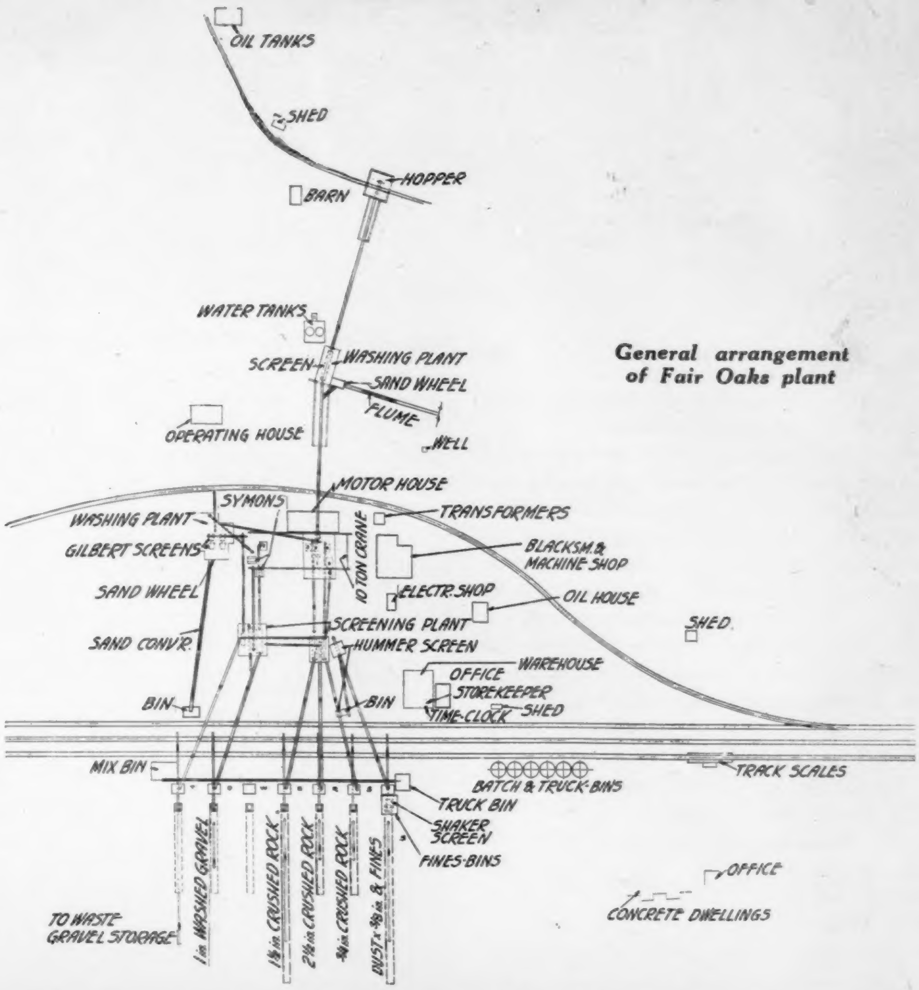
cycles, 3 phase. The shovel has a 2-yd. bucket.

Loaded cars are hauled to the plant (at present about a mile-and-a-half) by steam locomotives. The cars are run over a hopper, which is depressed below grade, and their loads dumped on a grizzly of railroad rails. A 36-in. belt conveyor operates in a concrete pit under this hopper. The loading of the conveyor is controlled by hand gates in the bottom of the hopper.

This conveyor elevates the material to a scrubber-screen, where it is washed. A large part of the silt is removed here. No attempt is made to size the material at this screen. Sand is separated and diverted to a sand wheel, washed, dewatered and returned to the larger material.

After passing the first screen, the material is elevated on another belt conveyor and delivered to the crusher plant. Here it passes through a scalping screen which takes out material 1¾ in. and less. This smaller material is delivered to the gravel washing plant on another belt conveyor.

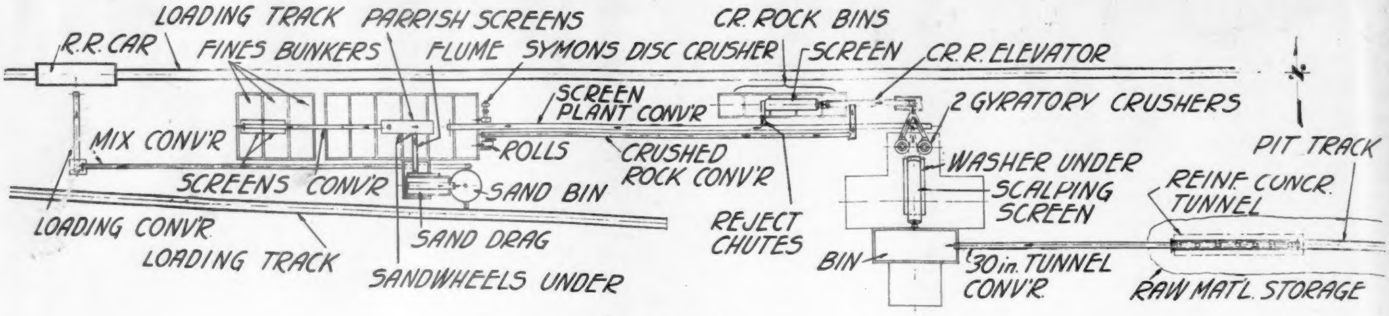
All material which will not pass the 1¾-in. screen is delivered to the crushers. The smaller sizes are delivered to five Farrel jaw crushers, 36x10 B. The rejects are delivered to a Farrel jaw crusher, 42x26 B. The large crusher is driven by a 150-hp. motor; each of the smaller ones by a 100-hp. motor. All crushers are belt driven. The entire plant is operated by electric power purchased from commercial lines. Flexibility is secured by individual motor drives.



General arrangement of Fair Oaks plant

Fairchild Aerial Surveys, Inc., Los Angeles, Calif.

Livermore Valley; Plant C at right, Plant D in middle distance, Plant A between and Plant B in left foreground



Flow sheet of Plant C in Livermore Valley

Gyratory Crushers Not Satisfactory for "Hard Heads"

Ordinary gyratory crushers were tried out at this plant, but they were not satisfactory. The boulders are so hard that breakage was very high. Sometimes the smooth boulders were squeezed out of the crushers, in some cases with sufficient force to go through the roof of the plant. The boulders at the Oroville plant are even harder than at this plant; they present even greater difficulties, and the crushing costs are higher at Oroville.

The material from the crushers is elevated to another screen by belt conveyors. This screen sizes the material, which is subsequently sent over a Hum-mer screen to remove the dust, then to cars or stockpiles. The rejects from this screen are delivered to a Farrel jaw crusher, 36x10 B, by a return conveyor.

The material under 1¾ in., which was removed before it reached the crushers, is delivered to the gravel washing plant by belt conveyor. Here it is screened, washed, sized and sent to gravel stockpiles on belt conveyors. Rejects from the screen are sent to two Symon's 48-in. disc crushers. The sand from the screen is sent to a sand wheel where it is dewatered. It is then discharged on a conveyor and sent to a bin, cars or to storage.

Material going to the stockpiles passes over three railroad tracks; the conveyors are supported on timber trestles. These timber trestles are extended over the piles as required. Material to be loaded out is returned to the cars on underground belt conveyors which operate in reinforced-concrete tunnels. These conveyors load the material direct into cars.

Most of the shipments from this plant are by rail, but there are some truck deliveries. Material for truck delivery is handled in six steel bunkers, capacity 110 tons each. These bunkers are elevated for gravity loading.

The plant is equipped with both track and truck scales. Water is supplied by company wells, pumped by electric power.

Electric power is delivered to the plant at 2200 volts from commercial lines. It is reduced by transformers to the voltage desired.

The Oroville plant is very similar to the Fair Oaks plant. Dredger tailings are available at Oroville in large quantities, as the plant is near the Feather river, which has also been a heavy gold producer. The principal difference is the harder boulders at Oroville with the consequent greater crushing costs.

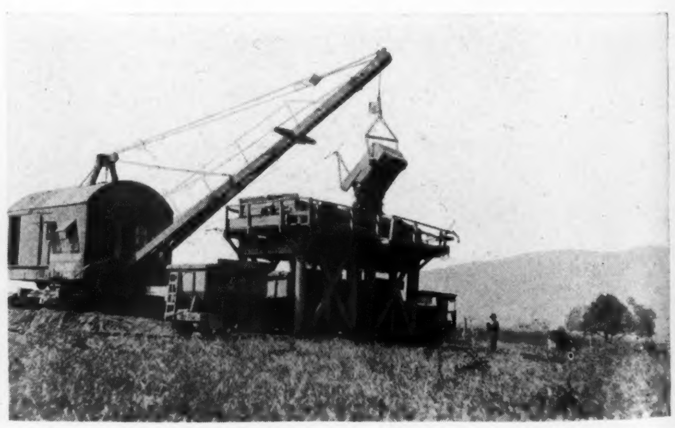
Sacramento Plant (O)

This plant is in the city of Sacramento, on the banks of the American river. It produces concrete sand, plaster sand, asphalt sand and engine sand for the railroads.

River Rock plant

An electrically-operated slack-line excavator brings the material from the bed of the river, raises it to a hopper on top of the plant. It then passes through a screen which rejects all gravel. Rejects are wasted back into the bed of the river.

The sand from the screen is carried by the water into a sand box where the amount of fine material which settles out is regulated by a water jet. The more the water in the box is disturbed by the jet the more fine material is carried away by the overflow.



Electric dragline at Niles plant and, at right, field loading hoppers

Sand is removed from the sand box by a system of steel flights mounted on an endless chain. As this chain moves slowly along the flights pick up the sand and deliver it to the chutes. It drops through these chutes to round wooden tanks mounted over a spur track. The cars are loaded by means of hand-operated gates in the tank bottoms. The different grades of sand are stored in different tanks.

The plant at Marysville is very similar to this one at Sacramento. Both are very simple. Both operate in river beds where the action of the stream replaces the material removed. In both plants the excavating equipment delivers the material to the plant.

General view of Niles plant

Livermore Valley Plant (C)

The floor of the Livermore Valley is a great gravel bed, 30 to 40 ft. thick. The Pacific Coast Aggregates, Inc., controls about 1000 acres of this land. Plant (*C*) is the largest and best equipped plant operating in natural deposits, so it is selected as being representative of this group. While the other plants vary greatly in size and details, the methods used are similar.

The material is excavated by an electrically-operated Bucyrus shovel, 80 B, on a caterpillar mount. It is equipped with a 2½-yd. bucket. This shovel loads the material into 30-yd. Western air-dump cars on standard-gage track. These cars are hauled to the plant by 40-ton steam locomotives.

The cars are dumped on a grizzly of railroad rails at grade. The material passes into an underground hopper and is fed to a belt conveyor through hand-operated gates in the bottom of the hopper. This conveyor elevates the material to the first screen. When necessary, men are stationed along this incline to remove roots and other debris which have been picked up by the shovel.

This first conveyor discharges the material into a scalping screen. Material passing the screen drops to a reciprocating scrubber just below. Rejects pass to two Allis-Chalmers 6-N gyratory crushers. Material from these crushers may be returned to the material from the scrubbers, or, when desired, it can be diverted to the crushing plant by means of a bucket elevator.

Material from this scrubber is elevated by belt conveyor to the main plant. This conveyor is a 30-in. Norton type on a slope of 18 deg.

In the main plant the material is delivered to a four-deck Parrish type shaking screen, 20 ft. by 6 ft. This screen removes the sand and sizes the gravel. Rejects are sent to the crushing plant by conveyor. Additional sizing is required, which is done in an addition to the original main plant. Shaking screens are used in this addition. When the gravel has been washed it is stored in bins below, different sizes in different bins.

Sand from the screens in the main plant is carried by the wash water to two sand wheels. The grade of sand produced by these wheels is determined by their speed. Sand which is too fine to settle out in the sand wheels is carried on by the overflow. After the second sand wheel has been passed, the fine material is settled out in a sand box. Fine sand is removed from this sand box by a drag conveyor. Different grades of sand are stored in different bins.

Rejects from the screens in the main plant are sent to a Symons 48-in. disc crusher. From this crusher the material passes to a system of screens. Material from the two Allis-Chalmers crushers is delivered to these screens when desired. Material is sized by these screens and dropped to bins below. This plant has a set of Allis-Chalmers rolls, 42x16-in., which reduce pea gravel to ⅛x¼-in. size.

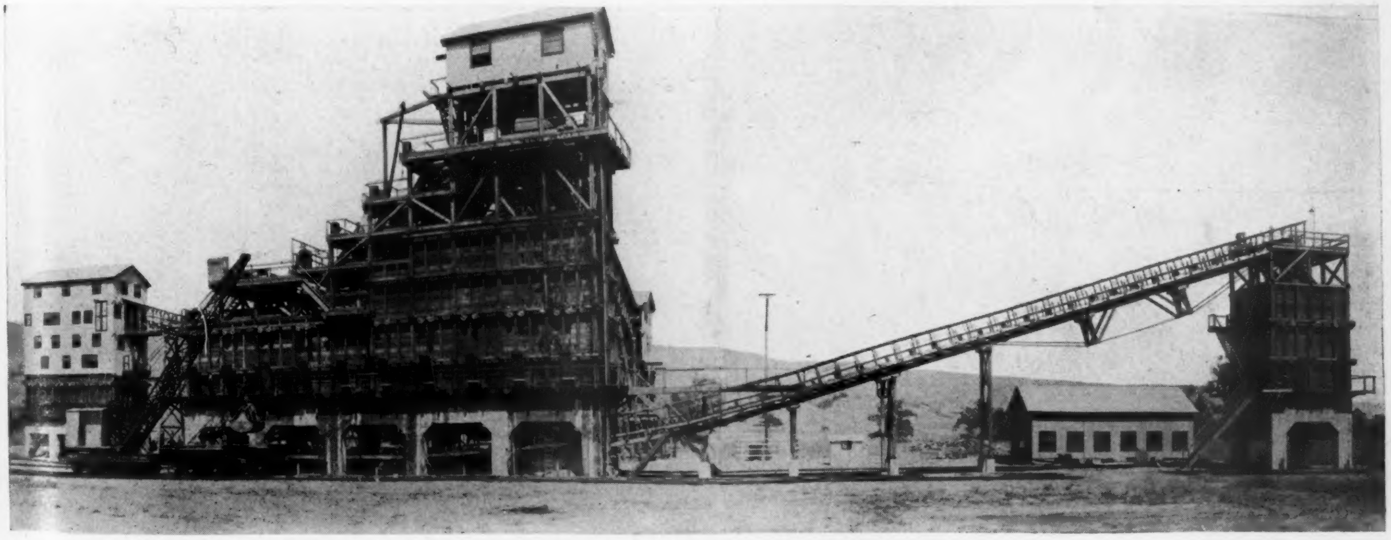
The plant is of timber construction. Material for shipment is stored in timber bins beside the tracks. Such material can be loaded direct into cars by gravity, or it can be loaded out with a 30-in. belt conveyor. This loading conveyor is arranged to pass under the gates of the various bins. By opening the gates of different bins at the same time any combination of sizes can be delivered to the cars. This mixing of sizes is done with both sand and gravel.

Surplus material is stored in stockpiles. Material is handled to and from these piles by a Brownhoist locomotive crane, Diesel powered, equipped with a 1¼-yd. clamshell bucket.

Cars are switched about the yard by a 20-ton Whitcomb gasoline locomotive. The plant is equipped with both track and truck scales.

Water from company wells is pumped by two 10-in. Byron Jackson pumps, each driven by a 100-hp. electric motor.

This plant is operated by electric power. Individual motor drives are provided for flexibility. Power is purchased from commercial lines, 3-phase, 60-cycle. Motors are operated at 440 volts. Power is delivered to



General view of Coyote plant

Fairchild Aerial Surveys, Inc., Los Angeles, Calif.

Aerial view of Niles plant showing narrow gage track for hauling material along river

Fairchild Aerial Surveys, Inc., Los Angeles, Calif.

Aerial view of Niles plant. Plant is on far side of river where two railroad trestles cross

the shovel by transmission line from the plant.

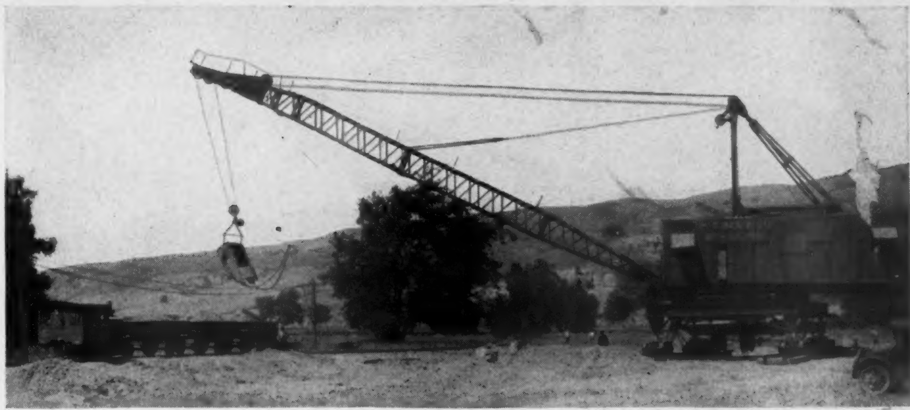
This plant supplies aggregate under a wide variety of specifications. A testing engineer is on duty at the plant at all times. A test is made of each car shipped. One copy of this test goes to the operating manager of the company in San Francisco, one copy to the engineer in charge of the work. A great deal of the output goes to the state. State specifications are strict, but they are very satisfactory.

Standardization of specifications for concrete aggregate would be a great help to the aggregate companies. A plant can be set up to meet any reasonable specification, but it must be readjusted to meet different ones. It is the lack of uniformity in specifications, rather than their requirements, which causes the material man to grow old and gray before his time.

This plant is typical of the plants of Group III. The plants were built by different companies and at different times, but they all operate along the same general lines. Pacific Coast Aggregates, Inc., has standardized them as far as possible.

The pioneer plant of this group is the Niles plant (*E*). This plant was built in 1911. It is much smaller than plant (*C*), but it operates in similar material and under similar conditions. At this plant the material is excavated by an electric Lidgerwood dragline. Material is loaded into 10-yd. steel hopper cars by means of a field hopper. These cars, 42-in. gage, are hauled to the plant by Plymouth gasoline locomotives.

The Coyote plant, (*S*), is the latest plant in the group. Many of the illustrations of this article are of the Coyote plant, as the equipment there is more modern than that at the other plants. Excavation is done by a Bucyrus Class 24 electric dragline. This dragline has a 100-ft. steel boom and is equipped with a 3½-yd. bucket. The material in which this plant operates and its products are much the same as that at the other plants of the group.



Dragline excavator at Coyote plant

The River Rock plant, (*Q*), furnishes an excellent grade of road gravel in addition to the products of the other plants of the group.

Monterey Plants (I) and (K)

Both of these plants operate on the beach of Monterey Bay. In each of the plants the beach sand is excavated by an electric dragline. This sand is washed, screened and stockpiled for shipment.

The product of these plants is high silica sand. It is used for filter purposes, plaster, engine sand, sand-blasting and for marble cutting. It is shipped by rail to all parts of the state.

Piedra Quarry (G)

This plant is one of the largest quarry operations in the west. It is located on the Kings river, about 20 miles east of Fresno. The plant was originally opened to provide ballast for the Atchison, Topeka and Santa Fe railroad, and is located on its tracks. It has a 180-ft. quarry face about 2000 ft. long.

Enough rock to last for two years is shot down at one time. This material is loaded into cars by a Bucyrus electric shovel 50 B, using a 2-yd. bucket. It is hauled to the crushing plant by steam locomotives—track gage 36 in.

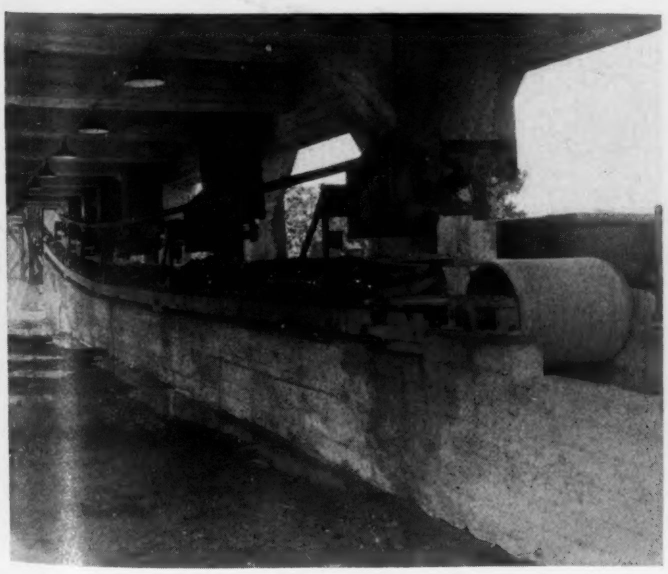
Rock from the quarry is dumped directly into an Allis-Chalmers 10 K gyratory crusher. Material from this crusher is screened. Rejects from the screen go to two 5 K gyratory crushers. The material from these crushers is again screened. Rejects go to a set of rolls and to a 36-in. Symons disc crusher.

Like the other plants of the company, this plant is operated electrically by power purchased from commercial lines. Most of the output is shipped by rail, although some material for local use is delivered to trucks at the plant.

Marine Fleet

Marine equipment consists of one barge equipped with unloading machinery, 12 wood barges, 40 ft. by 80 ft., one suction dredge operated by Diesel power, five small tug boats powered with Diesel engines and one derrick barge, steam-operated and equipped for use as a marine pile-driver. This fleet is maintained at a company owned and operated yard in Alameda.

The suction dredge is used to recover sand from the beds of the San Joaquin and Sacramento rivers. The barges and tug boats



Loading and mixing belt and, at right, revolving screens at Coyote plant

Distributing bunkers at San Francisco

are usec to make deliveries of material to projects hich are adjacent to the bay or rivers. M.erial used in the construction of the Souther Pacific railroad bridge at Martinez was elivered in this way. Channels are maintair l in the Sacramento river as far as Sacra ento, and in the San Joaquin river as far Stockton.

Organization

Charles M. Cadman is president and general manager of the company, with headquarters in San Francisco, and is in general charge of all the company operations.

Edward B. Kendall is operating manager. Mr. Kendall is in charge of plant operations, engineering and the marine operations. There is a superintendent in charge of each plant. These superintendents report, and are responsible, to Mr. Kendall. This centralized management of the various plants is a very important feature of the operations of the company. Mr. Kendall is also in charge of all purchasing.

Donald Meek is general sales manager with offices in San Francisco. The company tries to keep away from retailing as much as possible, and tries to handle its products through local dealers. While it has subsidiary companies which handle its products in San Francisco, East Bay Cities and Sacramento, it also distributes through local dealers in the same territory. Some sales are made direct to paving contractors for delivery at the various plants, but all hauling on such sales is done by the contractor's trucks.

Howard Senter is secretary and treasurer with offices in San Francisco.

During times of small demand, plants not needed are shut down; the demand is supplied from other plants. Some plants are operated only enough to keep their stockpiles in condition to render service on all sizes. The fact that all plants are under the same management makes it possible to reduce operating expenses to the minimum when business is not up to the usual volume.

Canadian Asbestos Production

ASBESTOS PRODUCTION in Canada during May totaled 9942 tons as compared with 8830 tons in the preceding month and 12,446 tons in May, 1931, according to a report issued by the Dominion Bureau of Statistics at Ottawa. Shipments during the first five months of 1932 amounted to 45,605 tons or 31.5% below the total for the corresponding period of the previous year.

Recent quotations showed increases over the prices of the past three months.

Fairchild Aerial Surveys, Inc., Los Angeles, Calif.

Aerial view of Livermore Valley. Plant A at left and Plant C at center

Small, Efficient Sand and Gravel Plant Powered Entirely by Gasoline

Individual Gasoline Motor Drives a Feature of the Plant of the Northeastern Iowa Sand and Gravel Co., Harpers Ferry, Iowa

GEORGE MILCKS AND JOHN RAGGENSACK operated a small sand and gravel plant on the upper Mississippi river, at Harpers Ferry, Ia., for many years, taking their material from a pit close to the river. The old plant used a 60-hp. Waukesha gasoline-motor-driven, ¾-yd. Green drag scraper, which had at times produced 20 cars of finished product per 10-hour day, with a gasoline consumption of only 40 gal. per 10 hours, so when they decided to build a new and larger plant it was but natural for them to stick to gasoline-motor-driven units throughout.

At the old pit, which is only a few hundred feet from the newer operation, water is encountered at about 30 ft. below the surface, but this did not prevent the operators from digging to a total depth of 95 ft. or 65 ft. below water level with their ¾-yd. drag scraper. Even then they did not reach the bottom of the deposit. At the new plant a 125-hp. Climax gasoline engine drives the two-drum hoist through a silent-chain drive. At present a 1¼-yd. Green drag bucket is being used, but eventually a 2-yd. drag bucket will be used as the hoist engine has ample power for the larger scraper.

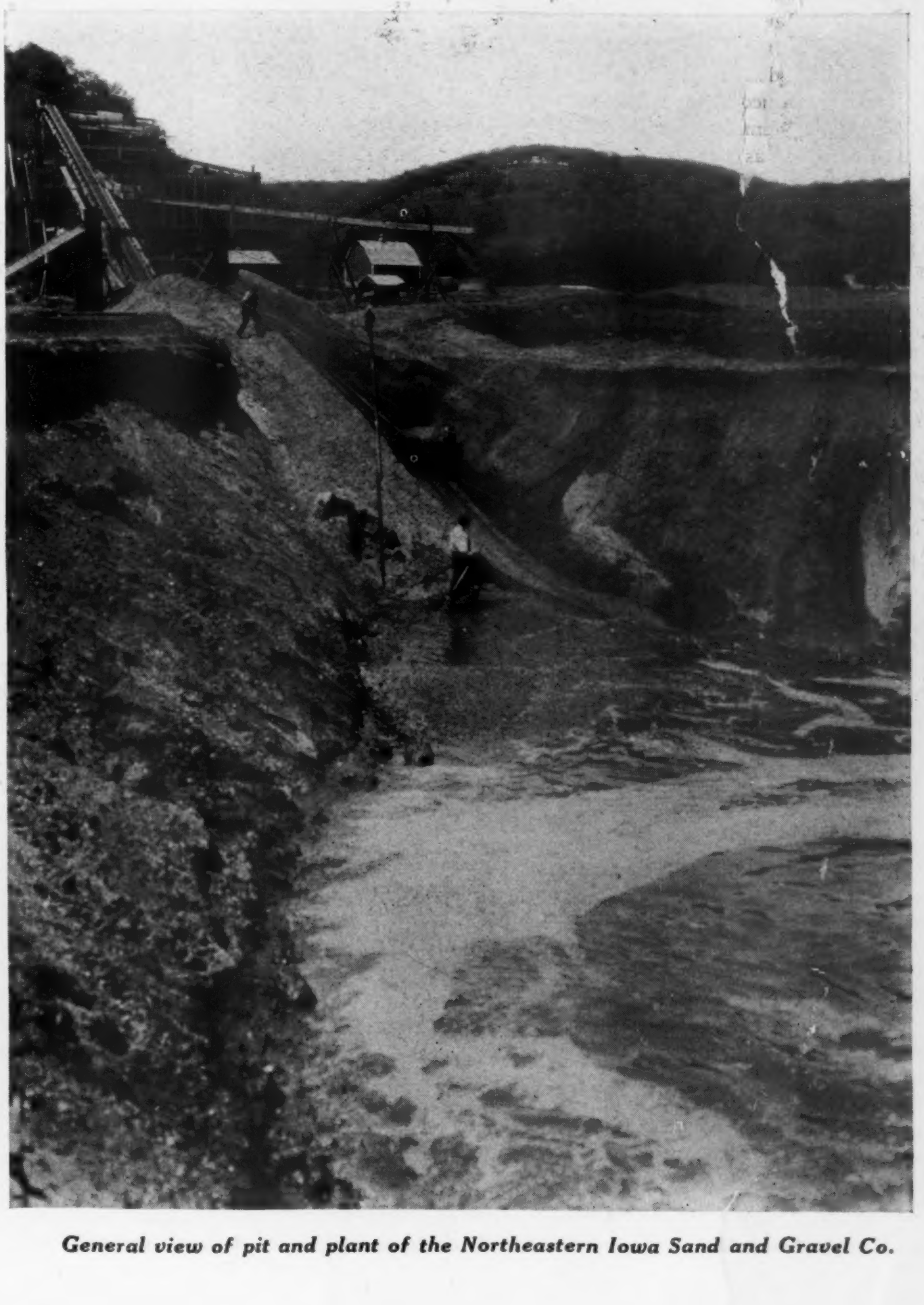
The plant was designed cooperatively by Mr. Milcks and the engineering staff of the Smith Engineering Works, and is a simple but efficient layout. The drag scraper delivers to a Telsmith pan feeder that serves a 24-in. belt conveyor delivering to the 48-in. rotary Telsmith screen. A novelty is here introduced in the form of a 26-hp. Waukesha motor that drives the belt conveyor through a belt drive and a 6-hp. John Deere gasoline motor that is belted to the rotary screen. Water is delivered to the plant from the old pit where a 6-in. Doud pump is belted to a 30-hp. McCormick-Deering gasoline motor, making the entire layout from start to finish a 100% gasoline-motor-driven operation.

The 1¼-yd. drag scraper has a capacity of 4 cars of finished material per hour during normal operations, but at the outset production was kept down to 2 cars per hour for the reason that at the surface or near the surface of the pit a small amount of silt is encountered with the gravel. As depth is reached this silt entirely disappears, as is shown from the old pit close by, but until depth is gained and the pit widened somewhat production is kept low so as to insure that the silt will all be removed at the washer.

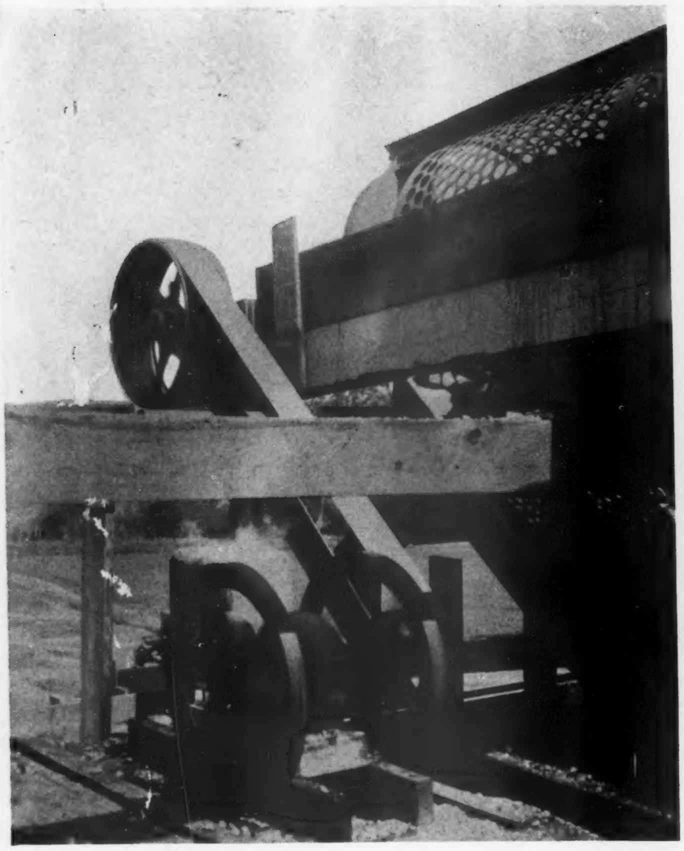
The drag scraper has a load speed of 200-ft. per min. and a return speed of 400 ft. per min. A 1-in. line is used for the load line and a ¾ in. for the return line.

It is planned to operate the pit with two drag scrapers. A 2-yd. scraper will replace the present 1¼ yd. and will pull straight away to the plant, while the ¾-yd. scraper from the old plant will dig at right angles to the larger scraper. The smaller scraper will pull the material up a short ramp to the present hopper serving the 24-in. belt conveyor, the snatch blocks being near the hopper at a higher elevation than the larger drag-scraper unit.

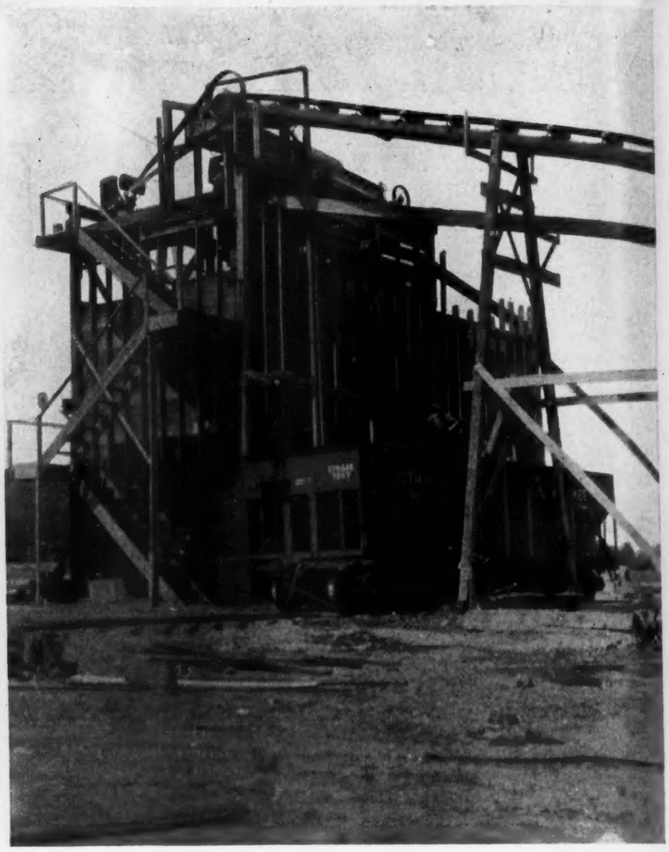
Owing to the use of a pan feeder and a belt conveyor it is desirable that the material as it is delivered to the hopper be as



General view of pit and plant of the Northeastern Iowa Sand and Gravel Co.



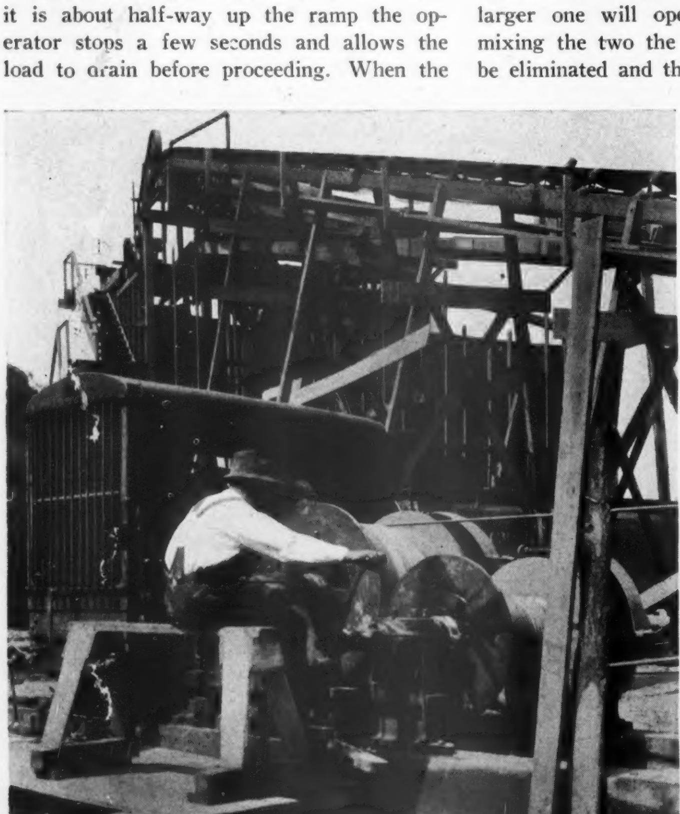
Gasoline engine driving revolving screen



General view of plant

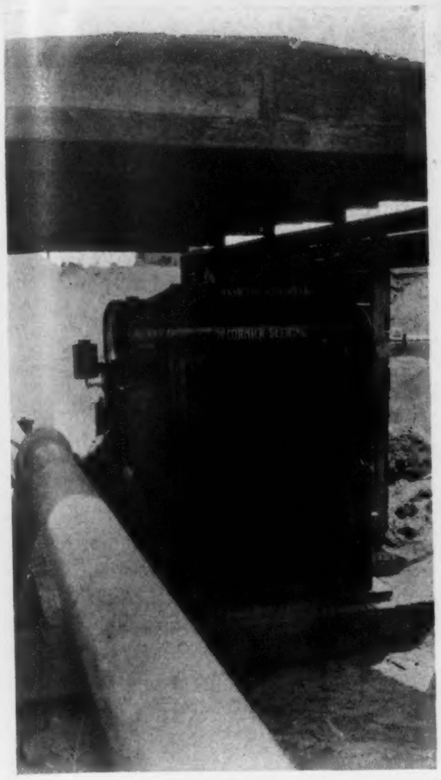
dry as possible. At present the practice is to load the scraper below water, and when it is about half-way up the ramp the operator stops a few seconds and allows the load to drain before proceeding. When the second drag is installed this unit will take dry material from above water, while the larger one will operate below water. By mixing the two the delay for drainage will be eliminated and the output increased.

As originally constructed two bins were used, but Mr. Milcks designed the plant so that eventually he will have in addition to bin storage an outside storage pile, which will provide storage for four sizes. These



Two-drum hoist driven by 120-hp. gasoline engine

Snatch blocks and cables with frame for second dragline



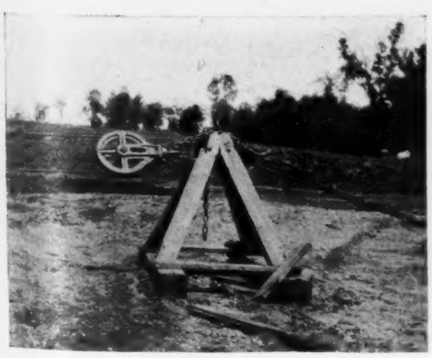
Gasoline engine which drives pump

four divisions will be arranged around a centrally located elevator shaft, so that he can feed the elevator from any pile.

The elevator will be inclined towards the tracks and be sufficiently high to load to this type of car. Thus, instead of reclaiming from storage by the conventional tunnel and belt conveyor, Mr. Milcks will reclaim by using an inclined bucket elevator. This unit will also be driven by a gasoline motor. Sand is recovered from a No. 7 Telsmith sand cone.

The two owners of this interesting gravel plant operate under the name of the Northeastern Iowa Sand and Gravel Co. Shipments are made over the Chicago Milwaukee St. Paul and Pacific Railroad.

Gasoline engine driving scraper hoist



End sheave and support for dragline

Indiana Limestone Men Form Institute

REPRESENTATIVES of 18 of the major stone companies in the oolitic belt on July 13 announced the formation of the Indiana Limestone Institute, an organization of arbitration for the purpose of promoting the sale of limestone and for bettering relations among competing companies.

Articles of incorporation for the Indiana Limestone Institute were filed in the office of the Monroe county recorder.

In its capacity as an arbitration board the institute proposes "to adopt and prescribe rules to institute fair trade practices and to prevent unfair trade practices and dishonorable transactions in business and to expel any of its members and stockholders for violating its rules, by-laws and regulations."

W. H. Johnson, president of the Bloomington Limestone Co., is the president of the new organization; J. L. Torphy, president of the Shawnee Limestone Co., is first vice-president; L. E. Donaldson of Bedford is second vice-president, who with Jesse G. Ray, president of the Bloomington Independent Limestone Co.; John Edgeworth of the Victor-Oolitic Stone Co.; Sam C. Fagan, Bloomington stone official; Theodore C. Pentzer of Bedford; A. E. Dickinson, president of the Indiana Limestone Co.; Lewis Ingalls, president of the Ingalls Stone Co., and Phillip C. Furst, president of the Carl Furst Quarries of Bedford, constitute the board of directors. G. H. Garrett, head of Matthews Brothers Stone Co. of Ellettsville, is treasurer.

The corporation was capitalized at $50,000, to be divided into 500 shares of $100 par value. Each of the 18 members and stockholders will hold 15 shares. The amount of capital stock with which the corporation will begin business is $14,500.

Operate Silica Deposit in Nebraska

A NEW INDUSTRY, silica mining, has sprung up in the south part of Red Willow county, Neb.

Silica in a raw state is mined at the Joe Hagg farm near Danbury and shipped out. A refining plant may be established.

The silica deposits were discovered after a company had been organized to prospect for gold. The silica was found in quantities sufficient to pay for mining operations.—*New York* (N. Y.) *World-Telegram.*

To Develop Limestone Property in Idaho

THE LONG-AWAITED official announcement concerning development of valuable properties near Portneuf Siding, Idaho, was made recently by Mrs. Clara J. Wood, owner, and other interested local parties. Work on the project is expected to commence soon, although full development of large scale operations will come later.

Frank H. Norberg, Denver, contractor, announced that work would be commenced as soon as his field manager, Frank Kelly, arrived in Pocatello.

This lime rock, which is to be produced at this time, will be used for the purification of sugar. There is an unlimited supply of the lime rock and the quality tests around 98 and 99% pure, according to Mr. Norberg, who states the Portneuf deposit is the finest he has ever tested. Mr. Norberg is affiliated with the Utah-Idaho Sugar, the Amalgamated Sugar, and the Great Northern Sugar companies and the Colorado Smelting and Refining Co.

It is expected that within the next two years a large tonnage will be produced annually at Portneuf. Contracts at quarries in Montana, Utah, Nevada and Idaho are holding up the local work to some extent, but when they expire it is expected a major proportion of the lime rock used by the Norberg concern will come from Portneuf.

Frank Kohler, who is managing Mrs. Wood's affairs in the project, stated that large brick and tile, cement and lime manufacturing concerns are being interested in the property, but announcement is being withheld of their identity until the deals have been closed.—*Pocatello* (Ida.) *Tribune.*

A. S. T. M. Committee Officers Elected

NEW COMMITTEE OFFICERS who have recently been elected to direct the activities of certain committees, and which elections take place in the even years, are announced as follows by the American Society for Testing Materials: Committee C-1 on Cement, secretary, G. A. Sager, consulting engineer, St. Louis, Mo.; Committee C-7 on Lime, chairman, James R. Withrow, professor of chemical engineering, Ohio State University; Committee C-9 on Concrete and Concrete Aggregates, chairman, R. W. Crum, director, Highway Research Board, National Research Council, vice-chairman, Stanton Walker, director, engineering and research division, National Sand and Gravel Association, and secretary, R. R. Litehiser, chief engineer, Bureau of Tests, Ohio State Highway Department; Committee D-4 on Road and Paving Materials, chairman, H. F. Clemmer, engineer of tests and materials, engineering department, District of Columbia; and Committee D-18 on Natural Building Stones, chairman, W. M. Greig, masonry engineer, and vice-chairman, F. Y. Joannes, architect.

Insulation Products of Gypsum Plaster

A Survey of United States Patents for Heat Insulating Compositions Containing Plaster of Paris

By Joseph Rossman
Washington, D. C.

PLASTER OF PARIS has excellent heat insulating qualities and has therefore been widely used in the construction of buildings in the form of plaster boards. It is also used for making building blocks for partitions, fire-boards, pipe coverings, linings or fillings for safes, boiler coverings, etc. Plaster of Paris has been made porous by adding ingredients which evolve gas, giving it a cellular structure. By this method very light and excellent heat insulating material is produced. The processes for producing porous plaster compositions were given in a separate article in Rock Products, September 28, 1929. This review covers other United States patents which have been taken out for making heat insulating compositions from plaster of Paris.

Plaster and Wood Fiber

The heat insulating composition described in U. S. Patent No. 684,091 may be given here as an example. This composition is intended to be used in making building blocks for partitions, for pipe coverings, fire-boards, and the like, and the object is to produce a composition suitable for the above uses which will be cheap, light in weight, fire, water and sound proof, and generally non-conductive.

The mixture is composed, essentially, of calcined gypsum and wood fiber in about equal proportions, by bulk, or about five parts of gypsum to one part of wood fiber, by weight. When these ingredients are thoroughly mixed and become set, they produce a substance which partakes of the characteristics of both wood and artificial stone. It is advisable to add to suitable portions of the above ingredients a small quantity of alum or a small quantity of alum and salt.

In preparing this composition the following proportions are taken: calcined gypsum 1000 lb., wood fiber 200 lb., alum 1 lb., salt 1 lb. The alum and salt may be dissolved in a quantity of water, sufficient when added to the gypsum, to reduce it to a thin paste; and the fiber should then be added to this mixture and thoroughly intermixed by a mechanical mixer or otherwise.

Plaster and cement of all kinds have been used with a fibrous substance, such as hair, wool, asbestos, and even wood fiber; but in every case the fiber has been merely a binding material for holding the substances together, while in this mixture the fiber constitutes a material part of the product and gives to it qualities which are not found in the other substances and which the product would not possess except as a result of such mixture.

The material is tenacious and solid, but at the same time light in weight and possesses many of the desirable qualities of both wood and adamantine structures. Nails and screws hold well in it, and it does not crack, although smooth plaster-like surfaces can be obtained. Cement and plaster also readily adhere to it, and it is an exceedingly good non-conductor of heat. The function of the alum in this composition is twofold, it tends to make the gypsum set more quickly, and furthermore adds materially to the coherence of the fiber particles and gypsum. The salt acts as an additional accelerator. A small quantity of whiting can also be introduced with advantage, giving an added smoothness and finish to the product.

Linings for Safes

One of the first inventions of fire-safe filling or lining consisted of plaster of Paris mixed with sufficient water to cause it to set or harden, and the interposition of sheets of mica between it and the iron walls, with which the mixture would come in contact. Mica was also mixed with the plaster while it was in the pasty condition, so that when it hardened the mica became a part of the lining.

Fillings have been employed in safes and similar structures, consisting of different substances, such as alum and plaster of Paris, gypsum, lime, asbestos, and hydraulic cement. These and similar substances have been used separately and in various combinations, and they possess a very desirable characteristic, namely, they may be used dry or in a plastic state, and in the latter condition admit of being tamped or poured while wet into place, and then concreting or solidifying upon becoming dry. Thus such fillings serve to impart stability to the metal structure in which they are contained. While the stability thus obtained is of great importance, for instance, in iron safes, the fact that these wet-poured concrete fillings, when of sufficient thickness to afford the requisite protection against fire are very heavy, is a great objection. Safes having walls filled alone with any of these solid cement or concrete materials can have but small interior storage capacity in proportion to the exterior dimensions, because of the great thickness required for the walls made of these materials.

The invention described in U. S. Patent No. 283,133, for example, consists of a fireproof lining composed of a filling material or compound consisting of alum, plaster of Paris, gypsum, lime, asbestos, or hydraulic cement, or any one, two or more of these ingredients which will produce a compound adapted to permit of being tamped or poured wet, and which will then concrete or solidify, in combination with a thin covering of magneso-calcite board, placed on the inner or outer side of the concrete.

The United States patents for heat insulating compositions containing plaster of Paris are given in the following abstracts:

Patent Abstracts

1. *Little, 56,856;* July 31, 1866—Covering steam pipes and boilers with a coating of plaster of Paris cement, with or without a wrapping of canvas, for the purpose of retaining the heat and preventing its loss by radiation.

2. *Ashcroft, 59,338;* November 6, 1866—Ordinary hair, such as is used in mortars, is mixed either with hydraulic cement, lime and hydraulic cement, or plaster of Paris, as follows: hair and hydraulic cement, hair, hydraulic cement and plaster of Paris, hair and cement of any kind, either of which can be applied as a covering (making mortar) directly upon boilers or pipes. A coating of hair may be laid on and the cement poured upon it, so as to cover it entirely.

3. *Jones, 63,255;* March 26, 1867—The following proportions of ingredients, when peat, turf, bog or silt is used, in combination with other substances, are found to give a good result; peat, turf, bog, silt or a mixture of them in any desired proportion, 100 lb., roman or portland cement 20 lb., oxide of iron 15 lb., lime 10 lb., sand 10 lb., cow hair 4 lb., gypsum or sulphate of lime 2 lb., mineral oil 4 lb. This composition, when used in a plastic state, may be applied by hand or by a trowel, in one or more coats, in conjunction with wood or otherwise, according to the nature of the material or of the surface to which it is to be applied. Hay bands may also be used to facilitate the putting on of the composition or material to pipes; and in order to render such hay bands incombustible they may be saturated in lime and water or other calcareous substance.

4. *Ott, 88,661;* April 6, 1869—Forty pounds of fibrous gypsum, mica or gneiss

slate, or amphibolite of the fibrous variety; 75 lb. of quartz-sand, quartzose slate, or italcolumite; 75 lb. of concentrated lye of commerce; 40 lb. of a talcose silicate, such as talcose mica, talc, saponite, steatite, talcite, or any mineral belonging to the class of the serpentine; 10 parts of powdered leather, fine sawdust, cotton or wool shoddy; and 10 parts of roman cement are mixed and exposed in a glass pot, to a white heat, until the desired combination has taken place. The resulting compound is diluted with water. There is introduced in the mixture of the above materials, with the exception of the concentrated lye, the quartz-sand, quartzose slate, or itacolumite, as much of silicate of soda, of from 25 deg. to 50 deg. Baumé, as to form a plastic mass, and apply it with a trowel or other instrument, to the surface to be covered. It will then become dry and hard.

5. *Riley and Bissell, 95,517;* October 5, 1869—This composition or cement is composed of a mixture of 12 parts of pulp used in the manufacture of paper, five parts of calcined plaster, two parts of lime putty, one part of white sand, one part of black lead, one part of soapstone; or, in lieu of calcined plaster, the same proportion of water lime cement.

6. *Baumann, 100,354;* March 1, 1870—To prepare the felting or composition for the first coating of steam boilers or other heated surfaces, one part of coal dust, three parts of crushed or ground asbestos, one part of calcined plaster, one part of ashes and two parts of lime putty made from limestone or oyster shells are mixed together. For the second or outer coating, five parts of ordinary paper pulp, same as used for paper making; two parts of lime putty, as above described; one part of pulverized soapstone; one part of coal dust; one part of ashes, and one part of calcined plaster are mixed with water to about the consistency of mortar for ordinary plastering.

7. *Harris and Howell, 102,116;* April 19, 1870—The invention relates to the use of ground or granulated cork, in combination with plaster of Paris and hair, or other equivalent materials, as a nonconducting covering for steam pipes, drums, generators, etc.

8. *Riley, 108,055;* October 4, 1870—The composition for covering steam boilers and pipes, made by combining ground gypsum or plaster, and any suitable fibrous material by means of lime putty or equivalent cement.

9. *Butler, 152,598;* June 30, 1874—Calcium chloride with plaster of Paris, clay, lime cements, asbestos, or other earthy or organic materials which will not decompose the chloride.

10. *Merriam, 156,710;* November 10, 1874—The invention relates to a compound for covering hair-felt on both sides, which is used in covering steam boilers, pipes and water-pipes; also, on cloth or paper for roofing and other purposes, it consists in uniting into one compound one gallon of pure clay, six gallons of soft water, six gallons prepared coal tar, one gallon of plaster of Paris, or sufficient to cut the tar.

11. *Merrell, 170,099;* November 16, 1875—The boiler is covered with felt which is coated with a composition steatite, charcoal, magnesia, bittern water, plaster of Paris and clay, which forms a hard shell.

12. *Carey, 189,301;* April 10, 1877—A nonconducting covering for steam pipes consisting of the following ingredients: fine wood ashes, steamed sawdust, Manila fiber, plaster of Paris, white glue, air slaked lime, all combined.

13. *Lyons, 200,320;* February 12, 1878—A fireproof composition composed of shell lime, plaster of Paris, coal ashes or the like, light earthy matter and alum.

14. *Marvin, 236,506;* January 11, 1881—The compound for filling safes and other fireproof structures consisting of a mechanical mixture or combination of powdered and calcined sulphate of lime with sulphate of alumina and potash, dry lime, or the carbonate of lime, and fibrous asbestos.

15. *Miller, 283,133;* August 14, 1883—A fireproof lining for boxes, safes, vaults and other like uses, composed of a compound of materials, adapted to permit of being poured wet or in a plastic state, and which will then concrete or solidify while drying, and a thin covering of magneso-calcite directly over the concrete.

16. *Fowler, 288,935;* November 20, 1883—Sheets of fireproof material produced by compounding, when in a dry state, calcined plaster of Paris, finely fibrilized asbestos, lamp black and pumice stone. Such dry compound to be wet with water to a suitable consistency, then run off upon a level surface into the thckness and size of sheets desired and allowed to dry.

17. *Fowler, 309,940,* December 30, 1884—A composition for a fireproof compound consisting of sifted ashes or the described earthy substitutes, calcined plaster of Paris, finely pulverized pumice stone, lamp black or other finely divided carbonaceous material, and finely fibrilized asbestos, or, in lieu thereof, animal or vegetable fiber, the whole to be in proportion substantially as stated, and to be prepared, mixed, wet, and incorporated into a plastic mass preparatory to use in a mortar like condition.

18. *Suhr, 312,037;* February 10, 1885—A tube covering formed of two semi-cylinders of plaster of Paris, asbestos and sawdust, covered on the outside with a layer of felt, which in turn is covered by a layer of thick paper.

19. *Suhr, 339,820;* April 13, 1886—A composition to be used as a boiler or pipe covering, consisting of a solution of alum and soda, a mixture of hair or felt, asbestos fibers, mineral wool, cork and sawdust, and plaster of Paris.

20. *Clayton, 369,099;* August 30, 1887—The composition consisting of cotton seed hulls or waste or refuse of cotton seed oil mills, treated with a solution of alum and combined with plaster of Paris as a binder.

21. *Miller, 465,717;* December 22, 1891—A coating composition for steam pipes made from plaster of Paris, feldspar, filtered kaolin mixed with lime or alum water.

22. *Miller, 465,718;* December 22, 1891—Boiler covering composition made from kaolin, hair, asbestos, feldspar, plaster of Paris, rag pulp, ground cork and sal ammoniac.

23. *Piffard, 467,520;* January 26, 1892—A composition for insulating purposes consisting of rubber, rosin and plaster of Paris, in the proportions, by weight, of 5 rubber, 24 rosin and 26 plaster of Paris.

24. *Christie, 477,647;* June 28, 1892—composition for covering steam pipes consisting of cotton dust or refuse from cotton mills, fire clay, sawdust, plaster of Paris, alum, flaxseed and rusty water.

25. *Mattison, 492,093;* February 21, 1893—A non-heat-conducting compound composed of carbonate magnesium, plaster of Paris, asbestos and wood pulp.

26. *Carey, 506,870;* October 17, 1893—A process for forming fireproof coverings, consisting in first thoroughly mixing asbestos fiber and plaster of Paris in a dry state, then mixing with water and Glauber's salt, molding and drying it, and then saturating with soluble glass.

27. *Manville, 527,867;* October 23, 1894—A covering for steam pipes comprising an outer body of wool felt, and a lining or inner body of permanently adherent composition material consisting of asbestos pulp, dextrine and calcined plaster.

28. *Platt, 684,091;* October 8, 1901—A composition consisting of calcined gypsum and wood fiber, in substantially equal portions by bulk together with a small quantity of alum whiting and salt.

29. *Oltmanns, 847,202;* March 12, 1907—The process of forming a slab, block or the like of building material, consisting in forming a binder of plaster of Paris and dextrine or the like, then soaking in the binder a number of vegetable fibers, then removing the excess of binder from the fibers, whereby the individual fibers are but slightly covered with the binder, and then molding the covered fibers into an interstitial body by slight pressure.

30. *Holmes, 858,601;* July 2, 1907—A molded board formed of a plastic material resulting from the combination of a cement, sawdust, excelsior in short lengths, moss hair and water.

31. *Armstrong, 1,310,893;* April 29, 1919—A plastic composition comprising approximately 85 lb. of calcined gypsum mixed dry with approximately 15 lb. of ground tan bark, the combined 100 lb. of dry mixture being again mixed with substantially 30 lb. of water.

Colorado Vermiculite—Its Discovery and Development

A Relatively New Rock Product with a Wide Variety of Uses

(Contributed)

THERE IS CONSIDERABLE ROMANCE connected with the discovery and development of new deposits of any mineral that has considerable commercial value. Therefore it naturally followed that the discovery of countless tons of vermiculite in Colorado that had amazing possibilities as a high temperature insulation would be surrounded with romance. Romance in business is always more or less interesting to many, but economy and efficiency are paramount today in the minds of those responsible for plant operation. It is therefore with this phase of the subject that this article will deal.

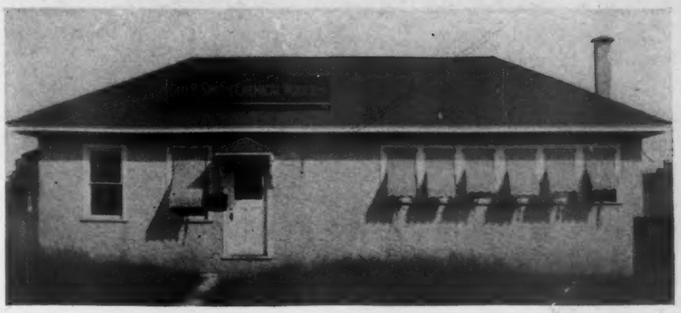
Colorado vermiculite has all of the physical properties and characteristics so much desired and so necessary for economical and efficient high temperature insulation. It has a fusion temperature as tested by Dr. J. C. Peebles of 2485 deg. F. It is chemically inert in every respect. It does not decompose or deteriorate even when saturated. Nor does it expand or contract from —40 deg. F. to 1800 deg. F. more than 0.002 of an inch per linear foot when made into boards. Its expansion and contraction is also negligible from absolutely a dry state to saturation. In addition to all of these remarkable qualities it has a thermal conductivity of 0.37 B.t.u. per 1 in. thickness.

The character of the granules of this Colorado vermiculite is such that it lends itself readily to the making of insulating brick, insulating block, fireproof insulating board, sectional pipe covering and insulating cements, as well as all types of insulating fills. In addition, on account of exfoliating a pure white in color, it may be used as an aggregate with plaster for acoustical treatments without impairing the decorative possibilities of the plaster.

It can be ground at small expense so that it will pass 90% through 325-mesh screen, which gives it a wide range of use in the rubber and kindred industries.

After it was definitely established that countless tons of this mineral with the physical properties as outlined was available it was necessary to work out methods by which it could be mined and brought to a central

The material is exfoliated in a rotary kiln



Plant and laboratory of the Geo. B. Smith Chemical Works, Inc., Springfield, Ill.

manufacturing point for distribution in the form of house insulation, insulating brick, insulating block, fireproof insulating board, sectional pipe covering and insulating cements at a cost low enough so that a profit could be made and the finished product sold at prices not to exceed the market on competitive materials.

First Use—House Insulation

All of these obstacles were overcome by the research and development division of the Geo. B. Smith Chemical Works, Inc., of Springfield, Ill. The plant for the exfoliation of the "ore" was first established. The first "ore" exfoliated was sold for the insulation of the upstairs ceilings of homes. The material was readily received by home owners throughout the middle west for this purpose because they could so quickly recognize its value to them in saving fuel in the winter and also in making the houses cooler in the summer. The low installation cost and the fact that there was no muss or dirt made it particularly attractive. Also the fact that the material was fireproof and absolutely sterile so that it would in no way encourage the nesting of rats, mice or vermin of any kind made a combination of qualities in one material that made it readily saleable.

Following this development, various formulae for insulating cements were next compounded. These were all tested for thermal efficiency, coverage, shrinkage, heat resistance, plasticity and bond. Finally two were selected which have proven themselves in use to be most efficient and economical in every respect. Smith's Insulating Cements Nos. 4 and 5 are now manufactured and sold throughout the middle west and have been used by many of the largest consumers of this class of material.

These cements, according to the manufacturer, have a covering capacity as high as 60 sq. ft. per 100 lb. wet and no volume or linear shrinkage when dryed. The dry weight per cubic foot in place will not exceed 20 lb. They have a thermal conductivity of 0.40 B.t.u. per 1 in. of thickness. Smith's insulating cements may be applied to hot surfaces and will bond strongly and quickly. They cost no more than competing cements and are 100% reclaimable when used in temperatures not exceeding 1650 deg. F., according to the manufacturer.

After the establishing of insulating cement on the market, insulating brick and block were experimented with. Pursuing the already established policy of the company that no material would be put into production until it excelled everything in its class and in addition could be sold at prices equal to other products with profit, all well known insulating bricks and blocks were tested in the Geo. B. Smith laboratories against bricks made from Colorado vermiculite. The formula was changed until the ideal one was decided upon, which made a brick superior to the five best known insulating bricks on the market. This brick made from the same ore as the house fill and cements proved to be strong, having a crushing strength of 175-200 lb. per sq. in., and a density of 22.5 lb. per cu. ft. It will stand constant exposure in back of refractory of 1850 deg. F. without any appreciable shrinking or checking. At a mean temperature of 80 deg. F. these bricks have a thermal con-

For some uses the product is ground to a fineness of 90% minus 325 mesh

ductivity of 0.47 B.t.u. per in. of thickness. At a mean temperature of 1090 deg. F., they have a conductivity of 1.15 B.t.u. per hr. With the special processes installed in the brick and block plant of the Geo. B. Smith Chemical Works, it is possible to turn out block as large as 36 x 36 x 9 in. This size means le.s cracks in the built-up insulation wall of a kiln, oven, boiler or furnace and less labor c st for the erection as well as less heat lo. nd consequently more efficient operation an much higher salvage when and if for any r son rebuilt. These blocks may be obtaine in all shapes and sizes and curves not o exceed 1/4 in. over 6 in. face.

Fireproof Boards That Can Be Nailed

Fireproof i sulating board made from the same ore, b Eternit, Inc., St. Louis, Mo., under license for Geo. B. Smith Chemical Works, Inc has all of the same characteristics and is i de in sheets in multiples of 1/8 in. It will nd exposure to 1700 deg. F. without any appreciable expansion or contraction, according to the manufacturer. At this high temperature it may be submerged in water without checking or cracking and with no visible change in dimensions. It has a high dielectric strength being 40 volts per mil of thickness for plain board or 63 volts per mil of thickness for impregnated board. The board may be nailed like wood without fracture and may be sawed with an ordinary wood saw without difficulty. It has high insulating value and compares in price with other boards heretofore considered fireproof and n t having the other properties which give this board so many uses.

A mill for the production of sectional pipe covering has just been completed and the same procedure as far as research and development ha been gone through with.

There was, of course, and still is considerable romance connected with the mining and production and development of these products, but more important than anything else is the fact that this new product offers consumers of insulating materials value for their dollar never before anticipated and at a time when the value of that dollar is most appreciated.

Reports Good Year

WE HAVE HAD a 33% improvement in business this year over last year up to this time, Sterling S. Lanier, Jr., president of the Kentucky Consolidated Stone Co., Louisville, Ky., has reported.

"Our company, which owns plants at High Bridge, Mt. Vernon, Yellow Rock, Tyrone, Upton, Mullins, Sparks, Russellville, Lilmay, Irvington, Nortonville, and one in Harrison county, now is operating 11 of these. By September we will have 14 plants in Kentucky, Mr. Lanier said.

"We not only operate our own quarries and deliver from the nearest point, but we will contract to operate private plants and in most cases save money for the owners.

New Building Materials Aid Nonmetallic Mineral Industry

(Contributed)

THE UPTURN in business which normally must follow every depression generally is accompanied by the sensational development of at least one manufacturing industry. The growth of automobile production and the phenomenal strides made by radio manufacturers are striking examples well within the memory of this generation.

Air Conditioning Means Much to Rock Products

The rehabilitating commodity of our present depression can not yet be identified, but fingers have been pointed toward air-conditioning equipment, especially that adaptable to residences. Others believe that increased residential construction will provide the impetus necessary to shake off the lethargy of our business structure. The two undoubtedly go together.

The construction industry is looking hopefully to residential building for its volume of business. Excepting Government projects, there is little building activity in most of our cities, and many are woefully overbuilt with offices, apartments, and hotels. The increased ease and efficiency of modern transportation methods have aided in fostering a back to the soil movement, and the development of suburban residential areas logically may be the basis of our next building boom.

Despite the low volume of business, however, the building industry is aggressively attempting to lower production costs, to increase the efficiency of sales methods, and to promote good will among potential buyers. New products and processes are evolving, some of which ultimately may revolutionize home building.

Present trends in building construction will be interesting to watch. Increased attention is being paid to heat and sound insulation, acoustical treatment, and fireproofing. The introduction of radical designs and new lightweight materials tends further to modify conventional home construction.

Several of these new products are directly related to the rock products industry, and their extensive development will expand markets for rock products. At least three fire-resisting wall boards developed recently definitely link fiber insulating boards to nonmetallic minerals. Two companies now are coating one or both sides of their standard boards with a thin layer of asbestos cement. In the Pacific Northwest, a board made of shredded wood impregnated and cemented with a magnesia compound has become quite popular.

Mineral wool continues to be used extensively for home insulation. Vermiculite, diatomaceous earth, and short-fiber asbestos are used in a similar manner but to a lesser extent.

Gypsum is one of the most common building materials. Gypsum plasters, wall boards, partition tile, and flake fill are used extensively in virtually all types of construction. Within the last few years, several weight-reducing additions have been made to the well-established line of gypsum products.

Pumice and other lightweight volcanic rocks have been used to a limited extent as lightweight aggregates in concrete. The inaccessibility of most of the domestic deposits, however, hinders further development Pumice also is an important constituent of various domestic and foreign acoustical plasters now on the market. In the Southwest, lightweight consolidated tuff has been sawed into various sizes and shapes and used as a dimension stone.

Two companies now are manufacturing compounds to be used in the commercial production of aerated concrete. The weight of the resultant concrete is directly under the control of the contractor, but the strength declines as the weight is reduced. The insulating and soundproofing qualities of this material are especially good. Aerated concrete has been used in this country principally for floor fill, partitions, and roof slabs, but in Europe entire houses and other buildings have been constructed of it. Numerous patents for several processes of manufacture have been granted, but only two have developed to the commercial stage.

Since 1928, a specially prepared water-granulated slag has been produced in the Chicago district. This material has been used principally as aggregate in the manufacture of precast concrete units, although it has been found to be satisfactory for floor fill and similar purposes.

The first practical use of burned-shale aggregates was for the construction of concrete ships during the World War. Five companies now are manufacturing the aggregate which developed from the experimental work undertaken during that period. A California inventor has modified this original process to the extent that his product is made in the form of round or elongated pellets of varying sizes which require no crushing. A sintering process for the manufacture of burned-shale aggregate also has attracted considerable attention. One of the large anthracite producers is experimenting

with a similar procedure. Other miscellaneous patents covering burned shale have been granted, but at present actual commercial production is confined to one aggregate. This product is being used in both structural concrete and concrete masonry units, in many instances resulting in a net saving in total building costs. It is available at present only in the Middle West and part of the East, but plans to expand production now are under way.

Interest in these new lightweight building materials is growing. Their unusual properties and advantages bear so much promise that they may occupy a prominent place among the select group of rock products which will help to lead the way to a new era of prosperity.

New Plant Manufactures Lightweight Aggregate of Slag

Manufacture of Lightweight Aggregate from Slag or Limestone Made Possible by a New Process

By H. M. Fitch

A DEVELOPMENT of importance in the aggregate industry has been announced by the General Aggregate Corp. of St. Louis, Mo. This development consists of a process for manufacturing lightweight aggregate, either from slag or limestone.

Physical properties of this new aggregate, "Cellastone," are said to be the same when manufactured of slag or limestone in combination with other minerals. The advantage gained through the use of slag where the manufacturing plant may be located adjacent to the source of slag is that the raw material is already at a high temperature, 3500 deg. F., required to obtain the product. Where limestone is used it is necessary to heat it to this temperature, which adds considerably to the cost of production. Data about the special process through which the molten material is placed are not available, but after processing the material is discharged in large quantities which are then crushed and screened to the desired sizes. The material weighs from 1000 to 1200 lb. per cu. yd. and is gray in color, about the same shade as slag.

Physical Properties of Material

The company reports that tests on material have shown that in a 1:2:3 mix average strengths of 4550 lb. per sq. in. have been obtained. These tests were conducted at the Washington University Testing Laboratory and St. Louis Testing Laboratory in St. Louis. Tests of the sound- and fire-resistive qualities of the material have also been made. For fire resistance a test was made in which units were heated to a cherry red, and when cooled no evidence of cracking or spalling was found. Incidentally, it is expected that a good refractory unit with insulating properties can be made with this material if it is produced with a special dolomite and used with special cements. It is stated by the company that a 2-in. wall of "Cellastone" block will practically eliminate radio sounds. It also provides insulation against extreme differences of temperature.

Tests for water absorption have shown that there is a very minimum of absorption as compared to other concretes. This low absorption is attributed to the cellular structure of the "Cellastone." It is stated that less mixing water is required in the production of "Cellastone" concrete than with absorptive aggregates.

Another interesting feature about this product is a claim that the fines are a form of cement and that a considerable saving in cement may be effected where "Cellastone" is used both as a fine and coarse aggregate.

Other properties claimed for the material are that it produces a concrete that can be readily sawed with an ordinary hand saw and that it provides a highly satisfactory nailing base.

At the present time a plant is in production at St. Louis. Slag is obtained from the furnaces of the St. Louis Gas and Coke Corp., adjacent to which is a processing department of the General Aggregate Corp. The resulting material is taken from this plant to the Rock Hill Quarries Co. plant, where it is crushed and screened to size. Because of the character of the material a special crusher is installed which is designed to produce a material of standard commercial size in suitable proportions to the requirement of the market. Except for the special crusher, other equipment at the rock quarry has not been added to or changed. The fines from 3/16 in. down are used for sand in the production of concrete units. In addition 3/16-in. to ½-in. and 3/16-in. to ¾-in. sizes are produced. The former is for coarse aggregate for precast concrete work and the latter is for heavy concrete construction.

A plant for the complete production of this material has been designed by the General Aggregate Corp. and such a mill is soon to be built in the Chicago territory, where it will serve from Indiana to northern Minnesota. This plant as now planned will have a capacity of 3000 cu. yd. After the Chicago plant is completed the company plans to build similar plants at Birmingham, Ala., Cleveland, Ohio, Detroit, Mich., and Pueblo, Colo. These plants will be adjacent to steel furnaces where that is economical. The St. Louis plant now in operation has a capacity of 1200 cu. yd. a day, but will be rebuilt along the lines of the recently designed plant.

Distribution of Product

In announcing its new aggregate and plans for distribution the General Aggregate Corp. states that it proposed to sell this material so that concrete products manufacturers may compete successfully, on a cost basis, with corresponding products in their own locality. Distribution will be made through material distributing companies and concrete products plants. The company does not propose to enter the manufacture of concrete products, it states.

The sale of the material for general construction will be through building material dealers. The development of this material is the result of several years of work and investigation. The difficulties and dangers encountered during the experimentation and development may well be appreciated when it is realized that the material dealt with was a fiery mass of molten mineral, 3500 deg. F.

"Cellastone" was patented by Claude H. Hunsaker with the cooperation of Bert Boaz and H. E. Billman. Mr. Hunsaker has been actively engaged in the concrete products industry for a great many years. Mr. Boaz is secretary and treasurer of the Boaz-Kiel Construction Co., and Mr. Billman is president of the Rock Hill Quarries Co.

The organization of the General Aggregate Corp. includes Bert Boaz, president; Claude H. Hunsaker, vice-president, and H. E. Billman, secretary and treasurer. The general offices of the concern are located in the Title Guaranty Bldg., St. Louis.

A Study of Classification Calculations

By Harry W. Newton and William H. Newton
Process Engineers, Chicago, Ill.

THE GROWING TENDENCY in the cement industry and other nonmetallic fields toward the use of classifiers in closed circuit grinding and for critical size control indicates that a complete discussion of classification as it deals with those industries would not be out of place at this time.

It will be the object of this article, therefore, to set forth a series of time proven calculations and formulas, the understanding of which should enable plant engineers and operators to more accurately analyze and interpret the results obtained with air separators, screens, wet classifiers, or other classifying devices. Furthermore, these formulas should be valuable as a means of comparing the various devices offered for this work.

Classification has received little serious consideration in the cement industry until recently, but has been practiced for decades in the metallurgical field. Engineers have been slow in attaining a complete understanding of the subject, and the most rapid strides toward good classification have been made in recent years. Indeed, scarcely 12 years have passed since the knowledge of what was desirable in classification became definite enough to allow the setting forth of a logical and correct method of calculating classifier efficiencies. It is not surprising, therefore, nor in the least discrediting to technical men in other industries, that their familiarity with the principles of this subject is limited.

Metallurgists generally use the term classification in connection with the work of wet classifiers in separating the solid constituents of a wet pulp into two portions according to their settling rates, but air separation and screening may also be termed classification when the material being handled is of a single specific gravity, as is usually the case in these industries. This is because essentially the same result is obtained by all three methods, that is, a separation according to particle size. The same terms, formulas, and calculations, then, may be applied to wet classification, air separation, and screening.

This article, therefore, will show procedures which are correctly and simply applicable to all methods of classification. It is true that special formulas may be derived for use with specific machines, but too many formulas are confusing and often worse than none at all.

In the following paragraphs, the calculations important in classification will be taken up one by one, each formula will be derived completely, representative problems will be worked, and the formulas which have been

Harry W. Newton

HARRY W. NEWTON, who, with his son and associate, prepared this analysis of classification calculations, was formerly associated with the Portland Cement Association as manager of the Conservation Bureau.

Starting his engineering career as a pyrometallurgist in the copper and lead smelters of the west, he became associated with the cyanidation treatment of gold and silver ores at the time fine grinding, as a means for increasing recoveries, was being introduced. He was active in the development of closed circuit grinding which displaced the open ciruit methods first used in this and many other treatment processes.

He has specialized in crushing and grinding and in the processing of mixed liquids and solids in chemical, metallurgical and other industrial fields, and has contributed valuable treatment mechanisms and methods. He is known throughout the iron ore mining districts for improvements in beneficiation methods resulting in important recoveries of iron formerly wasted and in the cement industry for crushing and grinding investigations which pointed the way to the improved grinding practices recently adopted in many cement plants.—The Editor.

most frequently published in the past and which are currently distributed by manufacturers of classifying equipment will be discussed. At the risk of appearing elementary, the authors will define all terms used and will show each step in the various derivations so that the clarity of the procedures may not be obscured by any slight misinterpretation.

The two portions into which the classifier feed is divided are designated as the undersize or finished product and the oversize or tailing product in terms of some critical mesh. The former passes on into the next step of the process or out as finished material, while the latter, in the case of closed circuit grinding, returns to the grinding unit for further reduction. In screening operations, employing accurate screens, the undersize product, of course, is free from contaminating oversizes; but the oversize product will carry with it more or less material finer than the screen opening. When other types of classifiers are used, each product carries some portion of material which belongs in the other product.

Thus we see that no practical classification operation is perfect or 100% efficient, but that every classifier has a degree of efficiency at which it operates under a given set of conditions. The determination of this efficiency is one of the most important problems in selecting a classifier for a given problem and in finding the optimum operating conditions for that classifier.

We must look to the intended function of classification in order to understand upon what basis efficiencies are to be determined. Is the function of a classifier only to produce one product of given specifications? If so, the screen is a highly efficient classifier, because it produces a perfect undersize product. However, if a screen produces an oversize product containing 40% undersize, the efficiency of the operation is seriously low. The true function of the classifier is to classify its feed into two portions according to a given critical mesh. Any efficiency determination must then be based on the ability of the classifier to do just that thing.

Definition of Classifier Efficiency

Classifier efficiency is defined, therefore, as the ratio of the weight of classified material in either product to the weight of classifiable material in the feed and is usually expressed in per cent. By this is meant that any portion of either product which does not belong in that product is in reality part of some unclassified feed which has found its way into that product. The amount of unclassified feed which this portion represents must be determined and deducted from the total weight of that product. The difference is the actual weight of classified material in the product. The ratio of this weight to that weight of the feed belonging in the product is the classifier efficiency.

Example I—Twenty tons per hour of tube mill discharge is fed to an air separator set to make a 200 mesh separation. The feed contains 60%-200 mesh material. The oversize or tailings product contains 30%-200 mesh and is 10 tons per hour in amount, while the undersize product contains 90%-200 mesh. To find the efficiency:

The 10 tons of undersize contain 10% or 1 ton of oversize material. Since the oversize in the feed amounts to 40%, this 1 ton of oversize material in the undersize product represents $\frac{1}{.40} = 2.5$ tons of material representing unclassified feed, which must be deducted from the 10 tons of undersize product in order to determine the weight of classified material in that product. Therefore, $10 - 2.5 = 7.5$ tons of the undersize product is classified material.

The feed contains 12 tons of undersize, hence the classifier efficiency $= \frac{7.5}{12} = .625 = 62.5\%$.

Since the air separator operates as a unit producing the two products, all of the inefficiency which shows up in connection with the undersize product should be disclosed in a consideration of the oversize product. Let us test our procedure from this standpoint.

The oversize product contains 30% or 3 tons of undersize material, which represents $\frac{3}{.60} = 5$ tons of unclassified material. Thus only 5 tons of this product is classified and since the feed contains 8 tons of oversize, the classifier efficiency $= \frac{5}{8} = .625 = 62.5\%$, which was to have been expected when the performance of the classifier is properly analyzed.

It is expected that at this point the reader will ask himself the question: "Since the undersize products of screens contain no oversize, do the same methods apply when screening?" In answer, such a problem is presented.

Example II—A 20 mesh vibrating screen is fed with 30 tons per hour of ball mill discharge containing 45%-20 mesh. The oversize product of the screen contains 15%-20 mesh.

The feed contains 16.5 tons of oversize, but this makes up only 85% of the oversize product. The amount of this product is then 19.41 tons, while the undersize product is 10.59 tons of —20 mesh material. All of the undersize product being classified, the classifier efficiency $= \frac{10.59}{13.5} = .784 = 78.4\%$.

But the oversize product contains 2.91 tons of undersize or $\frac{2.91}{.45} = 6.47$ tons of unclassified material. The classified material then is $19.41 - 6.47 = 12.94$ tons and the classifier efficiency $= \frac{12.94}{16.5} = .784 = 78.4\%$.

These examples should serve to illustrate the principles governing the calculation of classifier efficiency, and clarify the derivations of the formulas dealing with this subject.

Derivation of Formulas

For convenience, the same designations will be used in all formulas derived and are given below.

F = weight of classifier feed (any unit)
a = percent. oversize in feed (expressed as a decimal)
b = percent. undersize in feed (expressed as a decimal)
O = weight of oversize product (same unit as F.)
U = weight of undersize product (same unit as F.)
u = percent. undersize in oversize product (expressed as a decimal)
v = percent .oversize in undersize product (expressed as a decimal)
E = classifier efficiency (expressed as a decimal)

We know that:

$$F = O + U. \qquad (1)$$

Also:

The undersize product = undersize in feed — undersize in oversize product + oversize in undersize product or,

$$U = Fb - Ou + Uv$$
$$U = Fb - (F - U)u + Uv$$
$$U = Fb - Fu + Uu + Uv$$
$$U(1 - u - v) = F(b - u)$$

Therefore:

$$U = \frac{b - u}{1 - u - v} F. \qquad (2)$$

Similarly determined:

$$O = \frac{a - v}{1 - u - v} F. \qquad (3)$$

Then

$$\frac{U}{O} = \frac{\frac{b - u}{1 - u - v} F}{\frac{a - v}{1 - u - v} F}$$

Cancelling

$$\frac{U}{O} = \frac{b - u}{a - v}$$

So

$$U = \frac{b - u}{a - v} O \qquad (4)$$

and

$$O = \frac{a - v}{b - u} U \qquad (5)$$

Equations 1 to 5, then, give a simple and convenient method of calculating the weight relations of all products when the screen analyses based on any convenient mesh are known.

Classifier Efficiency

It has been shown that classifier efficiency may be calculated either by considering the oversize or the undersize product, so that it makes no difference from which angle the derivation is started. Remembering the definition of classifier efficiency and considering the undersize product first:

$$E = \frac{U - \frac{Uv}{a}}{Fb}$$

Then,

$$E = \frac{\left(1 - \frac{v}{a}\right) U}{Fb}$$

and

$$E = \frac{\frac{a - v}{a} U}{Fb}$$

Substituting for U from equation (2),

$$E = \frac{\left(\frac{a - v}{a}\right) \left(\frac{b - u}{1 - u - v}\right) F}{Fb}$$

Cancelling and combining

$$E = \frac{(a - v)(b - u)}{ab(1 - u - v)} \qquad (6)$$

When starting with the equation

$$E = \frac{O - \frac{Ou}{b}}{Fa}$$

in which the efficiency is considered on the basis of the oversize product, the value of O is substituted from equation (3), and the equation

$$E = \frac{(a - v)(b - u)}{ab\,(1 - u - v)}$$

is obtained as above.

Using this formula, the efficiency of any classifying operation may be quickly determined, without regard to the tonnages involved.

In closed circuit grinding that part of the total feed to the classifier which is separated into the oversize product and is subjected to the action of the grinding unit and returned to the classifier is known as the circulating load. This is usually expressed in terms of per cent. of the new feed to the circuit, or what is the same thing, as per cent. of the undersize or finished product. The calculation of circulating load may be simply carried out by the use of equation (5) determined above.

Let L = circulating load in per cent.

Then by definition,

$$L = \frac{O}{U} 100$$

and from equation (5)

$$L = \left(\frac{a - v}{b - u}\right) 100 \qquad (7)$$

To better illustrate the use of these formulas, three problems applying to each of the three common types of clasifiers; air separators, wet classifiers, and screens, are given on the following page.

Problem No. 1

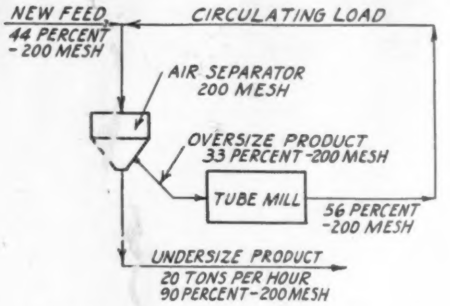


Fig. 1. Illustrating Problem No. 1

Known:

$U = 20$ tons per hour
$u = .33$
$v = .10$

$$b = \frac{20(.44) + .56\,O}{O + 20}$$

$a = 1 - b$

To find:
Tube mill feed $= O$
Percent. circulating load $= L$
Classifier efficiency $= E$

Calculation—The separator can obviously make no size reduction so that we may equate the amount of —200 mesh material entering the separator to the amount leaving the separator. Thus by simple algebra:

$$20(.44) + .56\,O = 20(.90) + .33\,O, \text{ or}$$
$$O = 40 \text{ tons per hour}$$

Then $$b = \frac{20(.44) + .56\,O}{O + 20}$$
$$b = .52$$
$$a = .48$$

From formula 7, $$L = \frac{a - v}{b - u} 100$$

Then $$L = \frac{.48 - .10}{.52 - .33} 100$$

and $$L = 200\%$$

Also (formula 6) $$E = \frac{(a - v)\,(b - u)}{ab(1 - u - v)}$$
$$E = \frac{(.38)\,(.19)}{(.48)\,(.52)\,(.57)}$$
$$E = .5075 = 50.75\%$$

Problem No. 2

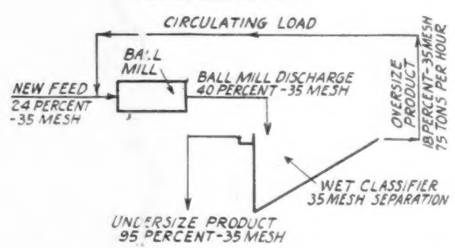


Fig. 2. Illustrating Problem No. 2

Known:

$a = .60$
$b = .40$
$O = 75$ tons per hour
$u = .18$
$v = .05$

To find:
New feed = undersize product $= U$
Ball mill discharge $= F$
Circulating load $= L$
Classifier efficiency $= E$

Calculation—From formula 4,

$$U = \frac{b - u}{a - v} O$$
$$U = \frac{.22}{.55} 75$$
$$U = 30 \text{ tons per hour}$$

Then (formula 1) $$F = O + U$$
$$F = 105 \text{ tons per hour}$$

And (formula 7) $$L = \frac{a - v}{b - u} 100$$
$$L = \frac{.55}{.22} 100$$
$$L = 250\%$$

Also (formula 6) $$E = \frac{(a - v)\,(b - u)}{ab(1 - u - v)}$$
$$E = \frac{(.55)\,(.22)}{(.60)\,(.40)\,(.77)}$$
$$E = .6548 = 65.48\%$$

Problem No. 3

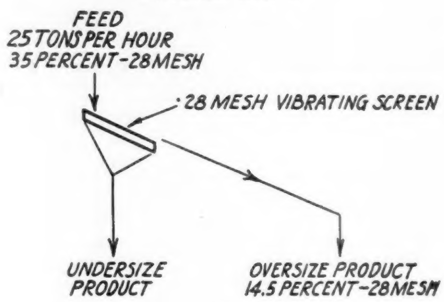


Fig. 3. Illustrating Problem No. 3

Known:

$F = 25$ tons per hour
$a = .65$
$b = .35$
$v = 0.0$
$u = .145$

To find:
Screen undersize $= U$
Screen oversize $= O$
Screen efficiency $= E$

Calculations—From formula 2,

$$U = \frac{b - u}{1 - u - v} F$$
$$U = \frac{.205}{.855} 25 \text{ tons per hr.}$$
$$U = 6 \text{ tons per hr.}$$

And (formula 1) $$F = O + U$$

So $$O = 25 - 6$$
$$O = 19 \text{ tons per hr.}$$

Also (formula 6) $$E = \frac{(a - v)\,(b - u)}{ab(1 - u - v)}$$
$$E = \frac{(.65)\,(.205)}{(.65)\,(.35)\,(.855)}$$
$$E = .6850 = 68.50\%$$

The working of these problems should demonstrate to the reader the simplicity of applying these methods to his particular problem, and the value of the seven formulas in solving any problem dealing with classification. They will be reprinted together at the end of this article to facilitate their clipping and use.

Other Methods of Calculating

Let us now look into one or two other methods published heretofore on the subject of classifier efficiency, particularly the most recent one printed in ROCK PRODUCTS, December 5, 1931, on the subject, "Formulas Applicable to Air Separation," by A. W. Catlin. To quote from Mr. Catlin's article:

"The efficiency of any selective apparatus such as an air separator is naturally the ratio between the amount of finished material recovered and the amount introduced into the machine in a given interval of time. If we feed a separator X tons of material carrying A percent. fines, and recover Y tons carrying C percent. fines, then the efficiency (E) is:

$$E = \frac{CY}{AX} \text{"}$$

While this formula provides a means for calculating the percentage of available finished material of the feed recovered in the finished product, it can be simply and conclusively proven that the formula does not give a correct measure of classification efficiency.

First, let us consider the theoretical condition that this separator be operated so that a perfect oversize product is produced; that is, an oversize product containing no fines. Although it might be necessary to carry 25 to 30% of oversize into the finished product in order to accomplish this, Mr. Catlin's formula gives 100% efficiency for this operation since all of the fines would be recovered in the finished product.

Let us also take the case of a classifier plugged in such a way that no classification whatever would take place. Suppose that 50% of the classifier feed came out as an oversize or tailings product and the remaining 50% as an undersize product. By the same reasoning, the classifier efficiency would be 50% because half of the fines in the feed would be found in the so-called undersize product, whereas no classification was being done, and the efficiency of the classifier in reality would be 0.0%. These theoretical cases show the fallacy of such a conception of classifier efficiency, which does not penalize the classifier for the oversize which occurs in the undersize product.

Furthermore, any correct method of calculating classifier efficiency should result in the same efficiency being obtained whether the calculation is based on the oversize or the undersize product of the classifier. That this statement is a logical one can be readily understood when we consider again the function of a classifying device. Any two-product classifier accomplishes or tends to accomplish one thing and that is the separation of undersize from oversize. This is carried out as one operation of the mechanism. There is, then, only one possible efficiency and that is the efficiency of the separation.

Whether calculated on one product or the other, this must be the same.

Let us now consider one of the examples given in Mr. Catlin's article.

The feed to an air separator is 135 tons per hour running 60% —200 mesh. The finished product is 60 tons per hour running 90% —200 mesh, while the tailing runs 36% —200 mesh. When based on the finished product, Mr. Catlin's method gives:

$$\text{Efficiency} = \frac{54}{81} = .6666 = 66.66\%$$

However, when the efficiency is calculated on the basis of the tailing product or oversize recovery by his formula:

$$\text{Efficiency} = \frac{48}{54} = .8888 = 88.88\%$$

If this be true, the air separator has a double efficiency, or what is the same thing, has two separate and distinct operations, which is not true.

Using the definition of classifier efficiency given in the present text for the same problem and considering the finished product,

$$\text{Efficiency} = \frac{60 - \frac{6}{.40}}{81} \text{ or}$$

$$\text{Efficiency} = \frac{45}{81} = .5555 = 55.55\%;$$

and considering the tailing product,

$$\text{Efficiency} = \frac{75 - \frac{27}{.60}}{54}, \text{ or}$$

$$\text{Efficiency} = \frac{30}{54} = .5555 = 55.55\%,$$

which is as it should be.

Considering further Mr. Catlin's formula as he has developed it,

$$E = \frac{C(A-B)}{A(C-B)},$$

and converting it to the nomenclature of this article,

$$E = \frac{(1-v)\,(b-u)}{b(1-v-u)},$$

we find that for calculating the efficiencies of screens in which operation $v = 0.0$ (or in his formula $C = 1.00$), his formula will give correct results. Indeed, as written above it becomes identical with ours, if $v = 0$ is substituted in both. That is:

Our formula:

$$E = \frac{(a-v)\,(b-u)}{ab(1-u-v)}$$

becomes

$$E = \frac{a(b-u)}{ab(1-u)}$$

or

$$E = \frac{b-u}{b(1-u)}$$

while his formula with our nomenclature

$$E = \frac{(1-v)\,(b-u)}{b(1-v-u)}$$

becomes

$$E = \frac{b-u}{b(1-u)}$$

This lengthy discussion of Mr. Catlin's methods is given merely to bring to the readers' attention the necessity for sound reasoning in regard to classification. The formula which he develops was in use for many years in the metallurgical field before it could be driven from usage by the logic of the method presented in this article, and today it is still being distributed by well known manufacturers of air separators for calculating efficiencies.

The second erroneous method which has been much published in recent years is the one discussed by Mr. Catlin in concluding his article:

$$\text{Efficiency,}\quad E = \frac{A - \frac{BC}{D}}{A},$$

where
A = per cent. undersize in feed
B = per cent. oversize in feed
C = per cent. undersize in tails
D = per cent. oversize in tails.

Careful examination of this formula will disclose the fact that it is based on the same definition of efficiency as Mr. Catlin's formula. The originator has first assumed a perfect undersize product and then calculated his recovery of undersize by deducting from the total amount of undersize in the separator feed that amount found in the tailings. The efficiency formula is thus derived as follows:

$$\text{Efficiency} = \frac{\text{Undersize recovered in undersize product}}{\text{Undersize in separator feed}}$$

(which is Mr. Catlin's definition)

$$\text{Efficiency} = \frac{\text{Undersize in feed—Undersize in tails}}{\text{Undersize in feed}}$$

$$\text{Efficiency} = \frac{\%\text{ undersize in feed} - \dfrac{\%\text{ undersize in tails} \times \text{weight of tails}}{\text{weight of feed}}}{\%\text{ undersize in feed}}$$

By assumption:
Weight of oversize in tails = weight of oversize in feed.
Weight of tails $\times$ % oversize in tails = weight of feed $\times$ % oversize in feed.

$$\frac{\text{Wt. of tails}}{\text{Wt. of feed}} = \frac{\%\text{ oversize in feed}}{\%\text{ oversize in tails}}$$

Substituting,

$$\text{Eff.} = \frac{\%\text{ undersize in feed} - \dfrac{\%\text{ undersize in tails} \times \%\text{ oversize in feed.}}{\%\text{ oversize in tails}}}{\%\text{ undersize in feed}}$$

Then

$$\text{Eff.} = \frac{A - \frac{BC}{D}}{A}$$

Converting to the nomenclature of this text, the formula becomes:

$$E = \frac{b - \frac{au}{1-u}}{b}.$$

Remembering that $v = 0.0$, which was assumed in order to arrive at the above formula, it can easily be converted to our formula for efficiency.

$$E = \frac{b - \frac{au}{1-u}}{b}$$

$$E = \frac{b(1-u) - au}{b(1-u)}$$

$$E = \frac{b - bu - au}{b(1-u)}$$

$$E = \frac{b - (b+a)u}{b(1-u)}$$

then

$$E = \frac{b-u}{b(1-u)}$$

which is the formula of this text when $v = 0$.

In practice, a perfect undersize product can be obtained only when the classification is carried out on a perfect screen, as no air separator or wet classifier will produce a finished product entirely free from oversize. The formula just discussed, then, as well as Mr. Catlin's, is correctly applicable only to screening problems and does not apply to other classification methods.

Summary

In conclusion, the requirements for any correct method of calculating classifier efficiencies are cited once more. First it must be based on the perfection of the classifier in separating a feed into oversize and undersize. Second, the efficiency must be the same whether the calculation is based on the oversize product or the undersize product,

for there is only one operation carried out and that is the classifying operation.

This discussion is not presented as a criticism of past work, but only in the hope that it will bring forth new thought in this direction. It is not expected that the readers will simply accept what is here presented, but it is hoped that they will decide to check up on their present methods and ideas of classification.

Here again are given the seven formulas on which this text has been based. They are placed so that they may be clipped and used as aids in selecting and operating classifying machinery. They will be found adaptable for slide rule and logarithmic calculation.

Newton's' Classifier Calculations

(These formulas are correct for use in dealing with any two-product classifying device.)

(1) $$F = O + U$$

(2) $$U = \frac{b - u}{1 - u - v} F$$

(3) $$O = \frac{a - v}{1 - u - v} F$$

(4) $$U = \frac{b - u}{a - v} O$$

(5) $$O = \frac{a - v}{b - u} U$$

(6) $$E = \frac{(a - v)\,(b - u)}{ab(1 - u - v)}$$

(7) $$L = \left(\frac{a - v}{b - u}\right) 100$$

In the above formulas, the following designations are used:

F = Weight of classifier feed (any unit-tons tons per hr., etc.)

U = Undersize (finished) product (same unit as F)

O = Oversize (tailings) product (same unit as F)

E = Classifier efficiency (expressed as a decimal)

L = Circulating load (closed circuit grinding) in percent.

a = Percent. oversize in feed (expressed as a decimal)

b = Percent. undersize in feed (expressed as a decimal)

u = Percent. undersize in oversize product (expressed as a decimal)

v = Percent. oversize in undersize product (expressed as a decimal)

Concrete Pavements

CONCRETE PAVEMENTS is the title of Bulletin 28, recently issued by the American Road Builders Association, Washington, D. C. It contains a discussion of the practical application of scientific and technical highway principles as presented at the Detroit convention of the association.

Gradation of Stone Sand for Concrete

(Reviewed by Edmund Shaw)

THE May-June issue of the *Crushed Stone Journal* is largely given to "stone sands," the principal article being "An Investigation of the Gradation of Stone Sand for Concrete," by A. T. Goldbeck, director of the bureau of engineering of the National Crushed Stone Association. The material chosen was limestone crushed to sand size in the association's laboratory, and not plant screenings resulting from crushing to larger sizes. The crushed material was not tested in mortars but as fine aggregate in a concrete made with crushed limestone from No. 4 to 2-in. size, with a straight-line grading.

The mortar-voids method of design was used, the idea being that all concrete should have the same slump and the same modulus of rupture. If this had been true the cement content necessary to give the required strength would be a criterion of the grading, assuming the workability of all mixes to be the same.

The slumps were fairly close to the 1¾-in. average except for one unworkable mix with a ½-in. slump and one extra workable mix which had a 3½-in. slump. The mixes with this method of design varied widely in the proportions of fine and coarse aggregate. As the tables show, there was considerable variation in strength as well as in cement content.

Workability was judged by the behavior in the slump test, the consistency as shown by the flow table and the judgment of trained operators. The mixes were rated from 1, excellent, to 5 poor; 4 and 5 being considered as unworkable for some conditions.

Two series of concrete tests were made, one with the cement contents varying from 5.87 to 7.34 sacks per cu. yd., corresponding to much of the paving concrete that is laid today, the other with cement contents running from 3.81 to 4.76 sacks per cu. yd., corresponding to the concrete used for pavement bases.

The results are given in great detail in the original article with three large tables and eight graphs. Space being limited here, what the reviewer considers to be the most significant figures of the tables have been combined to make a single table, and rearranged according to the fineness modulus. And only one of the graphs is reproduced, the triaxial diagram.

In the original article the variation of cement contents according to fineness modulus is shown by graphs, but it is equally clear in the table given here. Averaging individual variations by grouping the figures, it shows for the rich mixes:

Fineness modulus	Cement contents
RICH MIXES	
2.00 to 2.57	6.95 sacks
2.64 to 2.99	6.13 sacks
3.03 to 3.33	6.00 sacks
LEAN MIXES	
2.00 to 2.57	4.51 sacks
2.64 to 2.99	4.07 sacks
3.03 to 3.33	Only two tests

While the cement contents varied, the modulus of rupture for all three groups was fairly constant.

Fineness modulus	Modulus of rupture
RICH MIXES	
2.00 to 2.57	884 lb.
2.64 to 2.99	864 lb.
3.03 to 3.33	884 lb.
LEAN MIXES	
2.00 to 2.57	528 lb.
2.64 to 2.99	523 lb.

But the most interesting feature of these tests is the workability of the various mixes. Other investigators have shown that "stone sands" are in general somewhat higher in mortar strength than natural sands of the same fineness modulus, but in many cases of which the writer knows the high strength has been accompanied by harshness or inferior workability.

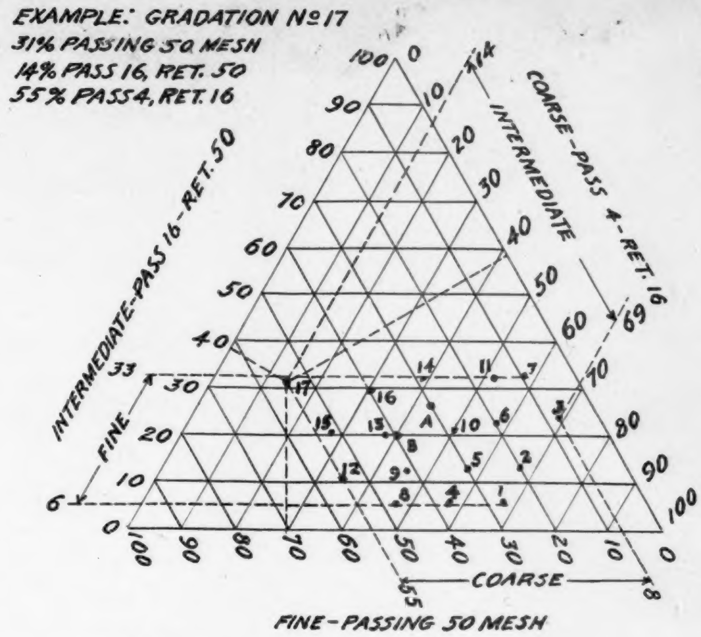
In these tests the workability, as is brought out in one of the graphs of the original article and in the table here, is shown to be related somewhat closely to the fineness modulus. All the rich mixes in the first group, fineness modulus 2.00 to 2.57, have very good workability (2), and most of them excellent workability (1). In the next group, fineness modulus 2.64 to 2.99, the workability drops off somewhat, the ratings being 2 and 3, and in the third group, fineness modulus 3.03 to 3.33, a still poorer rating is observed, two of the mixes having the ratings 4 and 5. The average of the first group is 1.17; of the second, 2.33, and of the third, 3.20.

But the effect of increasing fineness modulus on workability is still better shown in the lean mixes. For the group fineness modulus 2.00 to 2.57 the average is 2.0; for the group 2.64 to 2.99 the average is 3.8, and for the group 3.03 to 3.33 the average is 5.0, although only two samples in this group were tested in lean mixes, the others, presumably, being too nearly unworkable to receive a rating.

From this table and from the triaxial diagram given here, it is very plain that a fairly high percentage of fine particles is necessary for good workability in stone sand. The upper line of samples, 17, 16, 14, 11 and 7 in the triaxial diagram, have all more than 30% of material passing 50-mesh, and

the group of most workable mixes, 6, 3, 7, 11 and 14, all have from 22 to 32% of sand passing 50-mesh and a fineness modulus less than 3.00.

The fact that materials with so much fines may call for a fairly high water-cement ratio may not be so important as it would seem at first sight. In some cases it has been shown that the pozzuolanic (or similar) effect of stone dust is to give a higher strength than the water-cement ratio would indicate, and the tests seem to show that such is the case in this series of tests. In fact, the results show that the group from fineness modulus 2.12 to 2.57 are about as satisfactory fine aggregates as could be asked for in either rich or lean mixes.



Triaxial diagram showing gradation of stone sands

The difference in workability in rich and lean mixes for these stone sands has caused Mr. Goldbeck to suggest in the conclusion of his article that it may be economical to have two gradings, one to use with about 4.5 sacks cement per cu. yd. and one with 6 sacks or over per cu. yd. These are:

	A For 4.5 sacks per cu. yd.	B For 6 or more sacks per cu. yd.
Passing No. 4	100%	100%
Passing No. 8	85%	80%
Passing No. 16	70%	60%
Passing No. 30	52%	40%
Passing No. 50	27%	20%
Passing No. 100	5%	3%
Fineness modulus	2.60	3.00

The article notes that a number of other gradations would be suitable also. The position of these two gradings has been marked as *A* and *B* on the triaxial diagram.

While this suggestion is new, it is certainly correct in theory, for the cement is a part (and the most important part) of the grading that controls workability. Whether it will be practicable for a dealer to keep two kinds of sand, one for rich and one for poor mixes, is another question.

Cement and Lime Production in Canada

THE Canadian production of portland cement totaled 530,504 bbl. in May, according to a report issued by the Dominion Bureau of Statistics. In April, 427,320 bbl. were produced, and in May, 1931, the production was 1,090,449 bbl.

Exports of portland cement amounted to 5941 bbl., valued at $5108. Imports of portland cement reached a total of 1786 bbl.

Lime—Shipments of lime from Canadian kilns in May reached a total of 30,014 tons, an advance of 12.2% over the April shipments, but a decline of 3.8% from the May, 1931, production.

Developments in Tennessee Rock Phosphate

PHOSPHATE MINING in the Tennessee district continues at a low volume, with all but one plant being practically closed. Little withdrawal of material against regular contracts is taking place and new inquiries seem limited to new commercial uses, it is reported.

The Illinois Agricultural Association, one of the largest of the farmers' cooperatives, after careful survey of the situation decided not to engage in direct buying and selling of ground rock for the present and has continued its program of supervision of shipments as made and certifying fineness and grade of material as shipped to members in Illinois or others desiring this supervision.

After considerable discussion, this service was limited to the product of the only producer willing to submit his entire product to this supervision. The I. A. A. has therefore removed its office formerly maintained in Columbia, and laboratory at Mt. Pleasant, to the plant of the producer. The producer in question continues to handle the selling.

Through this arrangement a reduction in price of the high-grade product of from $1 to $1.25, in paper and cotton respectively, has been effected on Illinois shipments. The unsupervised products are still offered at lower prices per ton.

If the greater and more positive interest on the part of the local farm bureaus is thus aroused in rock or lime phosphate, and the Illinois Agricultural Experiment Station opinion finally becomes more definitely in favor of this product on which they have been in doubt for the past ten years or more, while more definite comparative experiments have been made to clear up the doubts cast on the original tests, the tonnage which may come from Illinois alone would put all the present producers to a severe test to produce it and would make all realize that the price question is really secondary.

Hand-mining operations on Bear Creek are taking advantage of the weather. The creeks are low, so it is as well the washers are not running. Stocks on hand are small.

DIFFERENCE IN WORKABILITIES OF RICH AND LEAN MIXTURES OF STONE SAND CONCRETE

Aggregates			Rich Mix					Lean Mix				
Sample No.	Fineness modulus	Voids rodded	W/C	Cement factor	A Workability	B Modulus of rupture	C Comp. strength	W/C	Cement factor	Workability	Modulus of rupture	Comp. strength
7	2.00	41.1	0.73	7.18	1	772	4660	1.10	4.72	1	545	2150
3	2.12	42.8	0.69	7.34	1	945	4580	1.03	4.76	2–3	616	2480
11	2.20	39.5	0.72	6.91	1	842	4580	1.06	4.50	1–2	548	2320
6	2.39	40.7	0.71	6.92	1	975	4760	1.12	4.47	1–2	496	2100
14	2.46	36.7	0.75	6.38	2	884	4300	1.12	4.17	2–3	484	2110
2	2.57	42.0	0.74	6.97	1	882	4520	1.10	4.45	3	544	2130
10	2.64	38.4	0.76	6.16	3	784	4070	1.15	4.10	3–4	496	1870
16	2.72	35.8	0.76	6.21	1	889	4650	1.13	3.99	4–5	518	2350
1	2.76	43.1	0.81	6.06	2	776	3940	1.18	4.23	4–5	536	1840
5	2.82	40.2	0.72	6.37	2	958	4350	1.06	4.23	4–5	550	2240
13	2.94	36.6	0.77	5.95	3	894	4150	......	......	......	......	....
17	2.99	33.9	0.78	5.93	2	869	4720	1.13	3.81	3–4	562	2140
9	3.03	39.1	0.72	6.37	3	864	4380	1.09	4.26	5	511	1960
15	3.08	35.0	0.76	5.87	2	888	4360	......	......	......	......	....
4	3.20	41.8	0.74	6.13	2	828	4470	1.21	3.98	5	492	1450
8	3.27	40.6	0.76	6.00	4	913	4280	......	......	......	......	....
12	3.33	37.1	0.77	5.66	5	893	3890	......	......	......	......	....

The Recast Analysis and Its Relation to the Chemistry of Portland Cement*

Part III—Relation of Actual Compound Composition to Potential Composition

By Louis A. Dahl
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Editors' Note

IN THE FIRST two articles of this series, published in ROCK PRODUCTS June 18 and July 16, 1932, the author explained the meaning of recast analysis and gave methods of developing formulae which replace some of the old ratios and express the relation between components of raw materials used in the manufacture of portland cement. In this installment the relations are studied further, using geometrical methods.—The Editors.

Section I. The Relation of Actual Compound Composition to Potential Composition

As a means of studying relations between actual compound composition and potential composition, the methods of analytic geometry are particularly useful. Let two fixed lines OX and OY (Fig. 4) represent the axes of coordinates. The line OX is the X-axis, and the line OY is the Y-axis. Any point is defined by its distance from the axes, measured in each case in a direction parallel to the other axis. For instance, the point P has the value $x = 3$, $y = 2$. The x-distance, 3, is measured from the Y-axis in a direction parallel to the X-axis. The y-distance, 2, is measured from the X-axis in a direction parallel to the Y-axis. It is customary to designate the position of a point in parentheses in the manner shown in the figure for the point P, the x-distance always being given first.

In applying this coordinate system, it is assumed that the axes are not confined to the limits of the paper on which they are drawn, but that they are infinite in length. Distances measured in the direction of the arrows are positive; in the opposite direction they are negative. The point O, which represents $x = O$, $y = O$, is known as the origin. In Fig. 5 a number of points are located according to this system, in order that the reader may see the meaning of negative coordinates.

In Fig. 6 a series of points have been located, in which the value of x is equal to the value of y in every case. It will be observed that these points are in a straight line. The equation, $x = y$, represents the relation between x and y at every point on the line, and is therefore said to be the equation of the line. Conversely, the line is said to represent the equation, $x = y$.

In Fig. 7 a series of points are indicated, in which the algebraic sum of x and y is 4 in every case. These points are also in a straight line. The line consequently represents the equation, $x + y = 4$. Figs. 6 and 7 have been used to illustrate the manner in which equations are represented graphically. Any equation involving x and y may be expressed in graphic form by means of a line. Certain principles are illustrated in Figs. 6 and 7 which will be applied in this study. Rigorous mathematical proof of these principles will not be presented. For such proof the reader is referred to textbooks on analytic geometry. These principles are given below.

1. Any equation of the first degree involving two variables may be represented by a *straight* line. Conversely, any relation which is represented by a straight line may be expressed by a linear equation of the first degree, involving two variables.

2. The relations indicated by a straight line are not confined to a portion of the line, but extend as far as the line can be extended. In fact, a line as drawn is only a segment of the line represented by an equation, which extends an infinite distance in each direction.

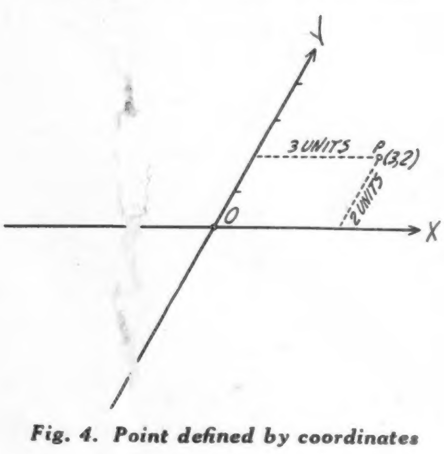


Fig. 4. Point defined by coordinates

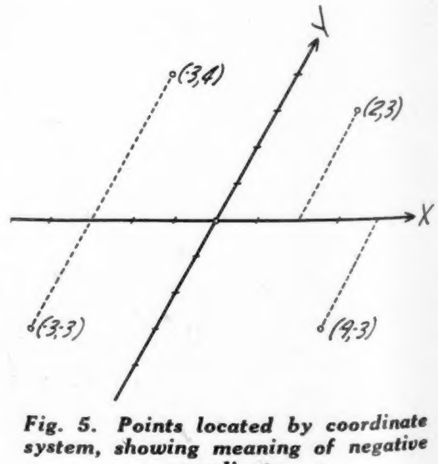


Fig. 5. Points located by coordinate system, showing meaning of negative coordinates

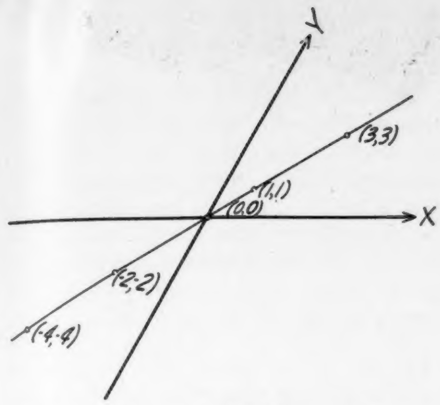


Fig. 6. Line representing equation, $x = y$

3. The relations expressed by the equation of a line apply when the coordinates are negative as well as when they are positive.

Now let us consider compositions of the three components, CaO, Al_2O_3, and SiO_2. If values are given to the SiO_2 and Al_2O_3, the value of CaO is fixed, since the sum of the three components is 100. It is consequently possible to define any composition of the three components by stating the percentages of two of the components. This is illustrated in Fig. 8, in which the axes of coordinates represent Al_2O_3 instead of x, and SiO_2 instead of y.

Let us suppose that we wish to locate the position of the line representing the equation,

$$SiO_2 + Al_2O_3 = 100$$

This is a linear equation of the first degree, and consequently may be represented by a straight line. Any two points on the line are sufficient to determine its position. The points (0, 100) and (100, 0) both fulfill the conditions of the equation, and so must be on the required line. After locating these points, a straight line drawn through them must be the line required. Any other points on the line, such as (25, 75) and (10, 90) may be used in locating the line, but it is generally more convenient to locate points on the axes. Lines representing the following equations are also shown in Fig. 8:

$$SiO_2 + Al_2O_3 = 75$$
$$SiO_2 + Al_2O_3 = 50$$

In the three-component system the sum of the three components is 100. Considering the line, $SiO_2 + Al_2O_3 = 100$, it is evident that for all points on this line, CaO = 0. This line corresponds to the SiO_2-Al_2O_3 line in Fig. 2. It is evident on examining Fig. 8 that this line may be taken as a reference line, or axis, from which to read the percentages of CaO in the same manner as percentages of CaO are read in Fig. 2. The relation of the triangular composition diagram to the coordinate system used in analytic geometry is apparent.

The relation of the triangular composition diagram to the coordinate system of analytic geometry has been shown in order that it may be understood that the principles of analytic geometry apply to the triangular composition diagram. When compositions are expressed in terms of the oxides, any composition involving CaO, Al_2O_3 and SiO_2 is located within the triangle formed by the lines joining these components (the CaO-Al_2O_3-SiO_2 triangle), and no negative values are encountered. When the equations in Series 2 are applied to compositions under consideration, the compounds C_3S, C_2S and C_3A become the components, and the lines joining these compounds become the coordinate axes.

Compositions within the triangle formed by these axes are represented by positive values throughout. Compositions outside the triangle are represented by percentages involving one or more negative values. Since the principles of analytic geometry apply, it is to be expected that negative values will have a definite meaning, and may be used in the solution of various kinds of problems.

Let us consider the first equation of Series 2:

$$4.07\ CaO - 7.60\ SiO_2 - 6.72\ Al_2O_3 = C_3S$$

For any value of C_3S this equation represents a straight line. Within the C_3S-C_2S-C_3A triangle these lines represent definite values of potential C_3S. Mathematically, however, the equation can be applied to compositions outside of the C_3S-C_2S-C_3A triangle. In Fig. 9 the values 0, 100, 200, etc., are given to C_3S, as well as negative values, —100, —200, etc. When these values are successively applied to the equation for C_3S, the lines shown in the figure are found. A series of lines parallel to the C_2S-C_3A line represent 100% intervals of C_3S. Percentages of C_3S are read from the C_2S-C_3A line in the same manner as was described in connection with Fig. 2. In reading from this line toward the C_3S point all values are positive. In the opposite direction they are negative.

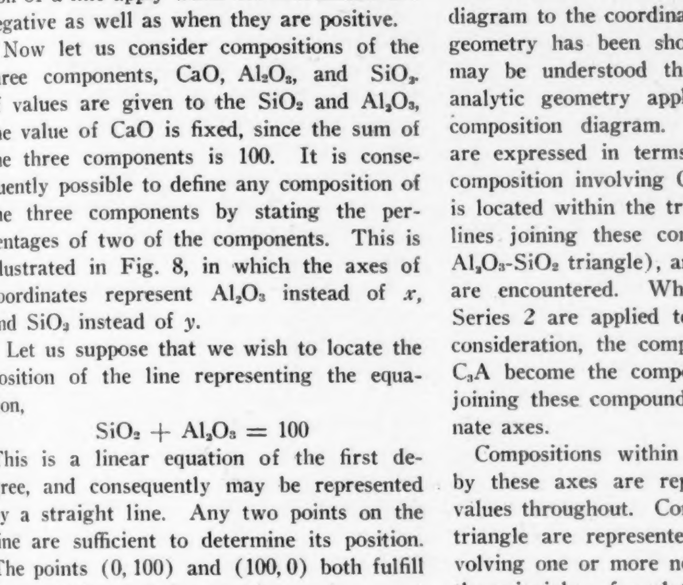


Fig. 8. Illustrating use of lines to define composition of three components

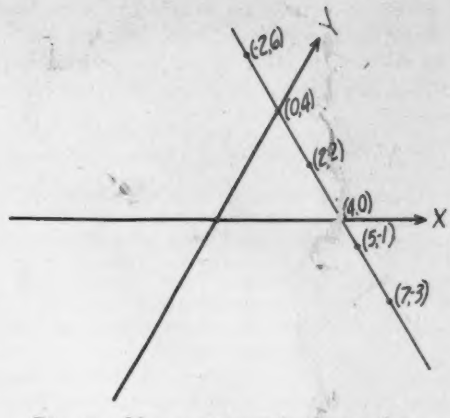


Fig. 7. Line representing equation, $x + y = 4$

Having found a definite geometrical meaning for the equation when applied outside of the C_3S-C_2S-C_3A triangle, let us see if it has a meaning with reference to numerical values obtained when it is applied to such compositions. Let us apply it to pure lime, which has the composition 100% CaO, 0.0% Al_2O_3, 0.0% SiO_2. When the equation is applied to this composition, it is found that

$$C_3S = 4.07 \times 100, \text{ or } 407.$$

The remaining equations may be applied similarly to the composition of pure lime, obtaining the following potential composition:

Compound	Per cent.
C_3S	407
C_2S	—307
C_3A	0
Total	100

To the reader who is not accustomed to interpret negative quantities the potential composition obtained by application of the equations may appear to have no meaning. It may be described in the following terms: 407 grams of C_3S minus 307 grams of C_2S is equivalent to 100 grams of CaO. This may be checked as follows:

407 grams C_3S = 107.1 grams SiO_2 plus 299.9 grams CaO
307 grams C_2S = 107.1 grams SiO_2 plus 199.9 grams CaO

Difference = 0.0 grams SiO_2 plus 100.0 grams CaO

The extension of the term potential composition to include compositions in which negative values appear opens the way for the derivation of general principles pertaining to the relation of potential composition to actual compound composition. In order that conclusions may be general, and not confined to any particular set of compounds involved in a particular system, let us consider the compound X, which may be any compound present in the potential composition of a material under consideration, which we will call M. Substances which are actually present in M but which are not included in the system of compounds named in the potential composition will be described as *extraneous substances*. The portion of M which would

remain if extraneous substances were removed will be referred to as the *remainder*. In this portion the potential composition and the actual compound composition are identical.

Let $(X)_P$ = potential X in M.
$(X)_A$ = actual X in M.
$(X)_E$ = potential X in extraneous substance.
$(X)_R$ = potential (and also actual) X in remainder.
r = fractional proportion of extraneous substance in M.
$1-r$ = fractional proportion of remainder in M.

The material M may be considered to be a mixture of the extraneous substance and the remainder; consequently,

$$(X)_P = r(X)_E + (1-r)(X)_R$$

Transposing:

$$(1-r)(X)_R = (X)_P - r(X)_E$$

But $(1-r)(X)_R = (X)_A$

(12) Therefore $(X)_A = (X)_P - r(X)_E$.

This equation may be expressed as follows: The actual percentage of a compound may be found by multiplying the potential percentage of the compound in the extraneous substance (or substances) by the fractional proportion of the extraneous substance in the material, and subtracting the result from the potential percentage of the compound in the material. From equation (12) the following conclusions may be drawn:

1. If $(X)_E$ is positive, $(X)_A$ is less than $(X)_P$.
2. If $(X)_E$ is negative, $(X)_A$ is greater than $(X)_P$.
3. If $(X)_E = 0$, then $(X)_A = (X)_P$.

These conclusions may be stated as follows:

1. Any extraneous substance which has a positive percentage of a given compound in its potential composition has the effect of reducing the percentage of that compound actually present to a value below the percentage indicated in the potential composition.

Example: Extraneous substances to the left of the C_2S-C_3A line in Fig. 3, such as free CaO or glass, will reduce the percentage of C_3S actually present. It should be noted that extraneous substances in the C_3S-C_2S-C_3A triangle belong to this class.

2. Any extraneous substance which has a negative percentage of a given compound in its potential composition has the effect of increasing the percentage of that compound actually present to a value greater than the percentage indicated in the potential composition.

Example: Substances to the right of the C_2S-C_3A line, such as free SiO_2, compounds in the C_2S-C_3A-C_5A_3 triangle, or glass, will increase the percentage of C_3S actually present.

3. Any extraneous substance which has a zero percentage of a given compound in its potential composition has no influence upon the percentage of that compound actually present.

Equation (12) applies to any system, involving any number of components. It should be noted that the potential compound composition of a material is not its actual compound composition unless all extraneous substances are absent. If extraneous substances are present, allowance must be made for them in calculating actual compound composition. In calculating compound composition of portland cement it is common practice to make allowance for free CaO and sometimes free SiO_2, both of which can be determined with a fair degree of accuracy. This is a logical procedure, and is sufficient if it is known that no other extraneous substances are present. Unfortunately this is seldom true.

In the burning of portland cement clinker a liquid phase, or melt, is present which may not crystallize completely on cooling, but may remain in the clinker as an undercooled melt, or glass. The glass is composed of oxides which are components of the clinker, but which have not combined to form portland cement compounds. It must be regarded as an extraneous substance. The amount and composition of the glass depend upon the conditions of manufacture.

To make allowance for it in calculating actual compound composition it is necessary to know the composition of the glass as well as the amount. Since that cannot be done by any methods known at present, the calculated compound composition should not be assumed to be actual compound composition unless it is known that no glass is present. In general, it may be stated that actual compound composition cannot be calculated unless there are no extraneous substances present which cannot be determined, both as to character and amount.

In order to illustrate the influence of glass upon actual compound composition let us consider the system CaO-Al_2O_3-SiO_2. This system has been chosen because it has been investigated very thoroughly by Rankin and Wright.[2] These authors have shown that when a composition in the C_3S-C_2S-C_3A triangle is fused, and then slowly cooled, the composition of the melt changes according to definite laws. At the temperature of the fused mixture the mixture itself is the melt. As the mixture is cooled a single compound forms first, appearing in crystalline form. The removal of the components of this compound from the melt causes a change in composition of the melt. On further cooling a point is reached at which a second compound appears. During all of these appearances and disappearances of solid phases the composition of the melt changes in a direction away from the original composition.

For all compositions in the C_3S-C_2S-C_3A triangle the melt finally is of the composition 58.3% CaO, 33.0% Al_2O_3, 8.7% SiO_2, at which point it remains until crystallization is complete, and the last trace of liquid has disappeared. This point is to the right of the C_3S-C_2S-C_3A triangle, in the C_2S-C_3A-C_5A_3 triangle (Fig. 3). The fact that the composition of the final melt is on the side of the C_3S-C_2S-C_3A triangle away from the C_3S point is also indicated by the fact that in the potential composition calculated by applying the equations in Series 2, C_3S has a negative value. The potential composition so obtained is: —50.5% C_3S, 63.0% C_2S, 87.5% C_3A.

Since the melt varies from the original composition, in the C_3S-C_2S-C_3A triangle, to a final melt composition to the right of the C_2S-C_3A line during the process of cooling, it is evident that an undercooled melt, or glass, present in the cooled product may vary from a composition which reduces the per cent. of actual C_3S to a composition which increases the per cent. of actual C_3S, depending upon the conditions of cooling.

The extent to which actual compound composition may differ from potential composition will be shown by considering a clinker of the composition 68.83% CaO, 7.55% Al_2O_3, 23.62% SiO_2. The potential composition of the clinker is 50% C_3S, 30% C_2S, 20% C_3A. Now let us suppose that 80% of the clinker consists of the three compounds named in the potential composition, and that the remaining 20% is glass of the final melt composition: 58.3% CaO, 33.0% Al_2O_3, 8.7% SiO_2. The potential

[2] "The Ternary System, CaO-Al_2O_3-SiO_2," G. A. Rankin. "Optical Study," Fred E. Wright, *Am. Journ. Sci.*, (4) 39 (1915), 1-79.

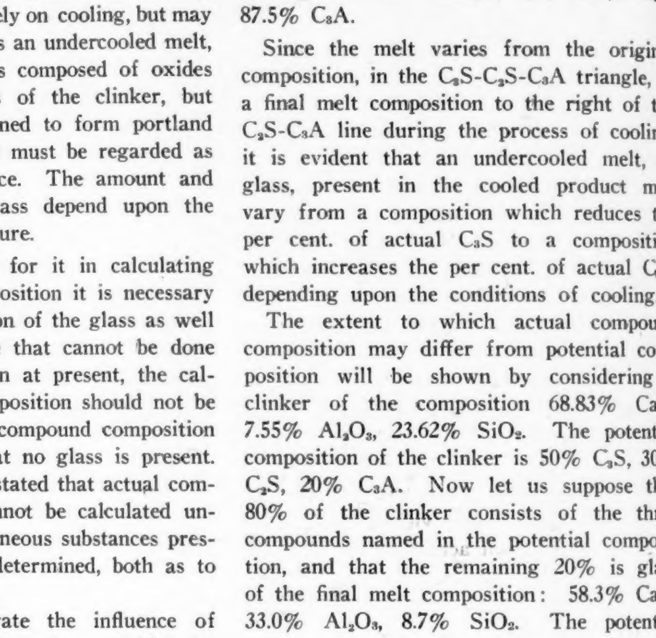


Fig. 9. Showing lines for negative as well as positive values in the equation

composition of this glass is: —50.5% C_3S, 63.0% C_2S, 87.5% C_3A. Applying equation (12) the actual compound composition may be calculated:

$$\text{Actual } C_3S = 50 + 50.5 \times 0.20 = 60.1\%$$
$$\text{Actual } C_2S = 30 - 63.0 \times 0.20 = 17.4\%$$
$$\text{Actual } C_3A = 20 - 87.5 \times 0.20 = 2.5\%$$
$$\text{Total} \quad 80.0\%$$

The remaining 20% is glass.

Now let us place the potential composition and the actual compound composition side by side for comparison.

TABLE 2. COMPARISON OF POTENTIAL AND ACTUAL COMPOUND COMPOSITION

	Potential	Actual
C_3S	50.0	60.1
C_2S	30.0	17.4
C_3A	20.0	2.5
Glass	0.0	20.0
Total	100.0	100.0

In the case of commercial portland cement there is no data available by which it is possible to select typical compositions of glass for the purpose of making computations similar to the above. However, since equation (12) applies to any system of any number of components, it is evident that similar possibilities exist in regard to actual compound composition when glass is present.

It should be quite clear from a consideration of the foregoing principles that control of the compound composition of portland cement involves more than control of elementary composition. A given portland cement raw mixture may yield a variety of products, differing in actual compound composition, through application of different temperature-time gradients in the process of burning. Cements of identical elementary composition, and consequently of identical potential composition, may be far different in hydraulic properties, as a result of differences in actual compound composition.

In discussions of the constitution of portland cement clinker the presence of glass is often mentioned somewhat casually, as a fact which must be mentioned, but which is of no particular interest. If it is borne in mind that any glass which is present contains components which must be regarded as components which have failed to enter into combination in the form of portland cement compounds, it is evident that the presence of glass is important in connection with any theory pertaining to the actual compound composition of portland cement.

(*To be continued*)

Feldspar in Canada

SHIPMENTS of Canadian feldspar during May were 423 tons, compared with 415 tons in April and 2100 tons in May, 1931, according to a report of the Dominion Bureau of Statistics at Ottawa.

Imports of crude feldspar amounted to 35 tons, and of ground feldspar, 125 tons.

"Design of Concrete Mixtures"

(Reviewed by Edmund Shaw, Contributing Editor, Rock Products)

THE JULY ISSUE of the *National Sand and Gravel Bulletin* has an editorial discussing the method of highway concrete design advocated by F. H. Jackson in a paper delivered before the National Sand and Gravel Association convention of 1932. The editorial summarizes the features of this design method as follows: (1) The flexural strength of the concrete is taken as the basis of design, except as limited by the maximum water-cement ratio permitted by considerations of durability; (2) all aggregates to be tested with the same cement without regard to the cement that is to be used in the work; (3) the proportions required to produce a given flexural strength are determined by a laboratory test of sufficient range to give the information. The laboratory-determined proportions are to be used in the work without reference to strengths obtained under field conditions. (4) It is recommended that all combinations of materials should be tested at the same time, or if this is not practicable each aggregate combination should be tested in comparison with an aggregate selected as standard.

Discussing the first, the editorial says that it is quite possible for two concretes to have the same flexural strength and vary widely in cement contents, water-cement ratios, and probably in volume changes, permeabilities, elasticities and other characteristics. Undoubtedly flexural strength is, perhaps, the most important characteristic, aside from durability. But since durability is universally considered to be of the first importance, it would seem equally logical to design for durability with a minimum limit on flexural strength.

With reference to testing all aggregates with the same cement, the editorial says that this leaves out of consideration the differences in the concrete-making properties of cement—the only active ingredient in concrete, an ingredient which may produce even wider variations in strength than the wide variations which may be obtained with different aggregates. Objection is made that introducing cement into the picture would require too much testing. The writer of the editorial does not think that the extra work required presents an insurmountable difficulty, as a relatively limited amount of additional testing would establish the differences in the concrete-making properties of available cements as well as aggregates.

The cement may affect results in another way than by actual differences in strength. Mr. Jackson does not think such effects important, but the editorial says that tests made in the association's laboratory indicate that they are important and that further study should be given to this factor.

The necessity for making all tests under the same conditions is emphasized by Mr. Jackson. Tests in the association's laboratory show differences in strength amounting to one sack of cement per cubic yard on identical combinations of cement and aggregates under carefully controlled conditions, over a period of 18 months. To obviate such variations it is proposed (if it is impracticable to test all materials at the same time) to test each material against a standard. But the editorial says this would mean that mixtures of materials would be designed not to give a definite flexural strength, as 700 lb., but to give whatever would be produced by the standard mixture which at one time gave 700 lb., but which might give 650 to 750 lb.

The editorial notes other objections, one being the accuracy of testing. A literal-minded engineer might test two aggregates and find one would take 1.50 bbl. per yd. and the other 1.55 bbl. for the same strength, a difference of about 3%. The difference in cost, perhaps 10 cents per yard, might be enough to reject an aggregate, although every engineer knows that this represents a greater accuracy than can be secured with carefully controlled laboratory tests. Mr. Jackson believes that results will justify classification of aggregates on a basis of 0.2 sack per yd. The author of the editorial thinks that 0.5 sack would be more nearly correct.

In conclusion the editorial says: "We agree that a more logical basis of fixing proportions than is in common use is needed. We are in sympathy with steps to take into account inherent differences in materials. All of which may sound inconsistent in the light of what has been said. Careful thought, however, will show that it is not inconsistent. We must couple our knowledge of the science of concrete with that of economics. We should not make fine-haired distinctions on one phase of the problem with the plea that there is that much advance, and neglect other phases less convenient to control. We should not swallow a camel and strain at a gnat."

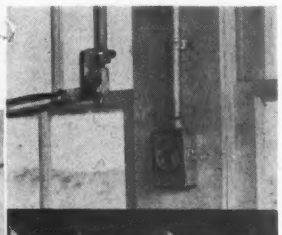
Effect of Magnesia on Color of Portland Cement

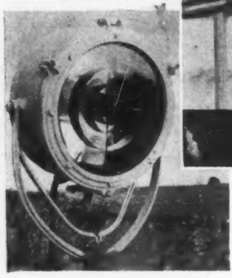
TO DETERMINE the effect of small quantities of magnesia on the color of portland cement clinker and on the formation of alite. Mitsuzo Fujii and Katsuniko Asaoka heated raw mixtures at 1500 deg. for one hour in a Udo furnace, then ground and passed them through a 4900-mesh sieve. All clinkers in system *A*, $SiO_2 \cdot Al_2O_3 \cdot CaO$, were yellow or yellowish brown, while those in system *B*, $SiO_2 \cdot Fe_2O_3 \cdot CaO \cdot MgO$, containing 0.5-6.5% MgO were grayish green. Among the cements in system *B*, in which natural limestone containing magnesia was used, one containing only 0.39% MgO was brown. Addition of a little MnO_2 or Na_2O to the system *A* gave brown or yellowish green cements. Addition of these oxides to the system *B* caused no change in the color.—*Chemical Abstracts.*

Hints and Helps for Superintendents

Searchlight Stops Nocturnal Thievery in Texas Cement Plant

INSTALLATION of a police boat type of searchlight at the plant of the Trinity Portland Cement Co., Dallas, Tex., caused the cessation recently of a series of nocturnal thefts of valuable company property.



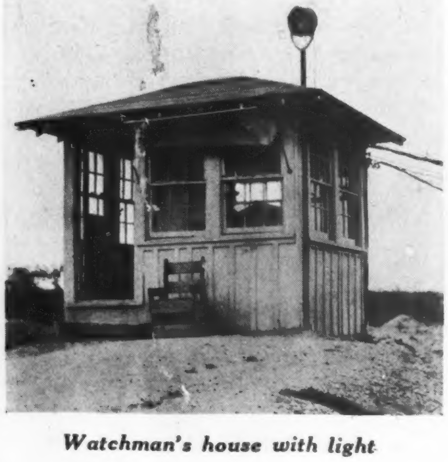


Above—The light control. At left—The light

The night watchman had been prevented in his attempts to prevent the stealing by threats from the thieves.

Cable and any other equipment which could be sold were removed in open defiance of the watchman. A large amount of copper had been taken from a 2300-volt transmission line, and also rubber-covered portable cable. On one occasion the watchman had come upon three men taking portable cable, and as he approached one of them the other two took positions on either side of him while the trio ordered him on his way.

General Electric engineers suggested the use of a searchlight. Accordingly a form J-68 Novalux searchlight of the type used on police boats was installed on top of a small building situated on a hill and thus commanding a view of all sections of the property. The light is controlled from inside the building and can be turned in any direction.



Watchman's house with light

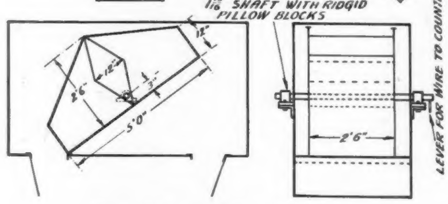
The watchman now stays in the tower all night, punching a clock at regular intervals. He very readily spots the beam, by the feel of the handle, with the light off, on any point in the quarry he wishes to check. He then turns the light on with the beam already directed. Thus, if anybody were at the point in question, he would be taken unawares. A rifle completes the watchman's equipment.

Nothing has been lost from the quarry since the installation of the light.

Self-Operating Tripper to Prevent Segregation in Loading Cars

By Nelson Severinghaus
Lithonia, Ga.

A SELF-OPERATING TRIPPER is in use at the Rock Chapel plant of Consolidated Quarries Corp. to aid in preventing segregation in cars and also to give an esti-



Roughly weighs the load

mate of quantity loaded. It is constructed throughout of ¼-in. sheet steel and 2 in. x 2 in. angle iron, electric welded at joints. In operation, when a gate in the chute from the loading bin is opened, the pivoted inside box fills on whichever side is presented to the chute. It then trips over presenting the other compartment and continues to operate itself in this manner.

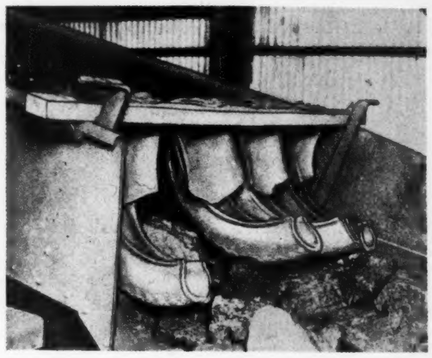
Thus a car is loaded in two rather well spread piles and segregation by rolling of large stone is prevented.

A further feature is its use as a rough weigher. It has been found that the box as shown takes about 940 lb. of stone to trip over and an automatic reset counter attached to a lever on the end of the pivoting shaft by means of a wire gives a close measure of the weight put in a car. This is of considerable value where cars are not weighed until they reach the main line of the railroad as at Rock Chapel.

The outside box is mounted on wheels of a channel iron track so that the whole apparatus may be moved back and forth and used on either of two tracks.

Retards Material Flow with Tires

A NOVEL WAY to retard flow of coal from screens to picking table is described in the *Coal Age* and might be found useful in some aggregate plants. At the Southern Collieries, Inc., Coal Creek, Tenn.,



Retards material flow on screens

these retarders are made from truck tires that have been mounted at the lower end of the main screen to slow the slumps as they slide onto the picking table and loading boom conveyor. As shown in the illustration, the sections cut from tires are nailed to a wood crosspiece clamped to the top edges of the shaker. At each stroke the tires swing upward to some extent, allowing the lumps to work under and between them. The point of maximum bending is reinforced and stiffened by a second thickness of tire wall material.

Magazines for Dynamite and Blasting Caps

THE accompanying illustrations show an unusual type of magazine for keeping

Magazine for dynamite

Blasting cap magazine is of steel

dynamite and also one for keeping blasting caps in the quarry.

These are both constructed so that they may be located comparatively close to the quarrying operations instead of at some distance and still provide a safe storage.

The dynamite magazine, which is of pleasing appearance, has a pipe vent out of the top as shown and is covered with stone screenings. The cap magazine is of steel construction, covered in the same way and vented and is arranged with a handy, hinged door which opens downward forming a platform when open.

Coyote Tunnel Cars

AT the Trap Rock Co.'s quarry at Dresser Junction, Wis., tunnel shooting is practiced exclusively and as the rock is extremely hard and difficult to drill it is desirable to keep the size of the tunnels down to a minimum. The removal of the debris from such tunnels is always a problem.

Here small, all-steel cars about 2 ft. long and 16 in. wide, mounted on small flanged wheels, are used for this purpose. Sectional pieces of track are used which can be removed or extended according to the desire of the miner. As a rule this track is laid so that the loads run by gravity to the adit for dumping and are returned to the face by man-power.

To return the cars to the face, a small I-bolt has been fastened to the chassis and a light rope is used to pull the car back into the tunnels.

Portable Drill Sharpening Shop

ALEX McKERNAN, superintendent of the New Haven Trap Rock Co. quarry at Branford, Conn., has developed a novel departure in drill-sharpening methods by installing the heater furnace and sharpener on a standard gage flat car so that, instead of the drill steel moving a long distance to the shop, the shop is moved to the quarry.

A few years ago this company changed from steam-driven drills to air operated hammer drills thereby getting a greater drilling speed, which with the increase in quarry tonnage necessitated an increase in the amount of sharp steel required. With a quarry face of over a mile long, the cost of handling the 1¼-in. steel in lengths up to 30-ft., to and from the old shop has been considerably reduced by the use of the portable shop.

The shop is 30 ft. long and is mounted on two standard gage railway trucks, the whole being built quite rugged, for it was intended to jack up the car to overcome the vibration from the sharpeners. It was found that this was not necessary. To give added length and light one end of the car is hinged at the bottom and can be dropped down as shown in the illustration. When it is desired to move the shop, the longer lengths of steel that may be in the shop are hung on side hooks, the drop end raised, the air line disconnected and one of the four steam locomotives that the company has in the quarry moves the shop closer to the drilling operation.

The car is equipped with an Ingersol-Rand and a No. 25 oil furnace and an I.-R. No. 50 drill sharpener.

Bagged materials are handled on easily made elevator

Elevator for Handling Bagged Material

THE accompanying illustration shows the use of a simple type of elevator for handling bagged materials from a box car to a mixing floor above.

It consists of a small belt elevator which has bent plates bolted to the belt at intervals of 8 or 10 ft. These plates are bent as indicated in such a manner as to hold the bag while it is being carried up.

Loading is facilitated by the use of a light platform consisting of a narrow piece of wood on each side of the belt, this forming a support for the bag until it is picked up by the bent plate.

End of car is lowered, adding room and light

Interior of portable drill sharpening shop

Highway Users Organize to Fight Diversion

OVER the road building industries hangs the spectre of diversion—the misuse of motorist-contributed road funds for purposes unrelated to road building. Starting innocently enough, diversion rapidly picked up speed. This year no less than $80,000,000 will go to doles, general budgets. schools, garden seeds and what not. This $80,000,000 paid in by motorists in taxes they believed beyond the reach of political tampering will not build a single mile of road. Rather, it will be costly to motorists and throw more men out of work.

The Highway Users Conference has been formed to encourage equitable taxation on motor traffic and to prevent such impositions as the diversions referred to above. The road building as well as motor vehicle and motor fuel industries should cooperate fully in this timely movement.—The Editor.

TO DEFEND motor vehicle tax funds against further raids, users of the highways are joining hands with motor vehicle manufacturers, the road building and the petroleum industries in an active and potentially powerful organization to be known as the Highway Users Conference.

At a recent meeting in Washington the Highway Users Conference was definitely organized and a general movement thereby put in motion to develop fair and just bases of taxation for the use of the highways and to prevent imposition of undue burdens upon highway traffic. The conference will collect and disseminate to its members information concerning present and proposed national, state and municipal legislation affecting vehicle taxation and legislation; it will study equitable policies of taxation for the provision and maintenance of highways, and it will act as a coordinating center for the activities of its members having to do with the general purposes of the conference.

Alfred P. Sloan, Jr., president of General Motors Corp., was elected chairman of the new organization. Ernest R. Smith, executive vice-president of the American Automobile Association, and Chester H. Gray, Washington representative of the American Farm Bureau Federation, were elected vice-chairmen, and C. J. Taber, president of the National Grange, was elected secretary-treasurer. C. F. Whiting, president, International Milk Dealers Association, Boston, Mass., was appointed chairman of the committee on procedure.

The advisory committee includes the following:

Three years:

- Chester H. Gray, American Farm Bureau Federation, Munsey Bldg., Washington, D. C.
- A. C. Pearson, president, National Publishers Association, 239 W. 39th St., New York, N. Y.
- Ernest R. Smith, executive vice-president, American Automobile Association, Mills Bldg., Washington, D. C.
- Alfred P. Sloan, Jr., president, General Motors Corp., 1775 Broadway, New York, N. Y.
- Amos L. Beatty, president, American Petroleum Institute, 250 Park Ave., New York, N. Y.

Two years:

- George E. Clinton, International Association of Milk Dealers, care of Sheffield Farms Co., 524 W. 57th St., New York, N. Y.
- C. E. Childe, chairman, Highway Transport Committee, National Industrial Traffic League, Omaha, Neb.
- L. J. Tabor, master, National Grange, 970 College Ave., Columbus, Ohio.
- J. D. Tew, Rubber Manufacturers Association, 250 W 57th St., New York, N. Y.
- Willard Chevalier, vice-president, American Road Builders Association, and of the McGraw-Hill Co., New York, N. Y.

One year:

- Herbert P. Sheets, president, Retailers National Council, Meyer-Kiser Bldg., Indianapolis, Ind.
- John Simpson, president, Farmers' Union, 630 Indiana Ave., Washington, D. C.
- C. O. Sherrill, National Chain Store Association; vice-president, Kroger Co., 35 E. Seventh St., Cincinnati, Ohio.
- Emory Rice, City Baking Co., Baltimore, Md.

National Highway and Building Congress

THE ROCK PRODUCTS INDUSTRIES are cooperating in the Highway and Building Congress to be held in Detroit, January 16-23, 1933. Plans are under way by a committee representing the various industries and groups interested in road building and general construction.

The congress, which, it is predicted, will be the largest and most significant gathering in the history of such enterprises, will be devoted to determining the place to be occupied by construction in the new economic era and to formulating plans for putting the many units of the mammoth construction machine back into profitable operation.

Joining in the plan are outstanding organizations such as the Construction League of the United States, American Road Builders Association, Associated General Contractors of America, Motor Truck Executives Association, Asphalt Institute, National Crushed Stone Association, National Paving Brick Manufacturers Association, National Ready-Mixed Concrete Association, National Sand and Gravel Association, and the Portland Cement Association. This powerful group doubtless will be joined by every other trade body in the combined industries.

During the first three days of the congress it is expected that there will be concurrent meetings of all of the various groups, using a number of the leading hotels. This will be followed by a great joint session which will map a coordinated procedure for all of the industries represented and allied. Federal, state and local officials as well as delegates and representatives of every branch of construction will be present to help chart the future course and pledge support to the plans adopted.

The following statement has been issued, declaring the purpose of the congress:

"Recognizing the fundamental importance of highway and building construction to every phase of the nation's life, public officials identified with it and leaders of every branch of the industry will meet in Detroit in January to devise a coordinated program of future activity. The meeting will be known as the Highway and Building Congress.

"It will essay to find the course best designed to contribute not only to the immediate improvement in national economic affairs, but also to seek a permanent program which will prevent a repetition of conditions which have existed for the past three years.

"One of the basic undertakings of the congress will be a program of education designed to acquaint the public with the contribution of the construction industry to sustained national economic equilibrium. It will define the place of highway and other forms of construction in respect to improved transportation, industrial and agricultural production and distribution, education, communication, and all other phases of national life.

"In the past it has been the practice of the associations representing various phases of the construction industries to hold individual meetings in different cities and at different times. They have cooperated in many ways, but their programs have lacked that degree of correlation which contributes most effectively not only to the industry's welfare but that of the public generally. The Highway and Building Congress, the first gathering of its kind, will inaugurate a new epoch which promises a more valuable service on the part of the industry to the country as a whole."
modities.

Every organization and every private business identified with construction should be represented to the extent of their ability. The spectacle of hundreds of local trade groups and thousands of private organizations cooperating in an enthusiastic and intelligent movement for trade recovery must impress confidence and it is expected that plans adopted at that time will clear the atmosphere of much of the current uncertainty.

ROCK PRODUCTS is for the Highway and Building Congress. We enroll, and we hope every producer will too.

Editorial Comment

"Man Shall Not Live By Bread Alone"

The following brief extracts from a recent address of Dr. Virgil Jordan, eminent economist, strikes a very sympathetic chord in us—and we trust it will with you. It is at least something like the point of view that we have tried to hold continuously in our editorial conduct of ROCK PRODUCTS throughout the recent depression, and the kind of a point of view we trust we shall continue to hold until our last breath. In other words, we still think that the depression was not necessary and not according to economic law, but was caused by the ignorance of society of the real economic law.

"For nearly three year's now American business has been progressively paralyzed by an increasing confusion of thought about its meaning and purpose, accompanied by an unparalleled collapse of morale. As a whole, the American people have been routed into a shameful retreat from what I feel has been one of the most promising adventures in the history of the human race. To me it is the most amazing and depressing spectacle in the whole panorama of human progress, this spectacle of a free, intelligent, energetic and advanced industrial nation armed with an abundance of natural resources and productive equipment, deliberatively dipping its standard of living in surrender to the dead hand of outdated economic doctrine, repudiating every principle of social progress developed for the promotion of the public welfare and the protection of the community during the past generation.

"The really fundamental fact that confronts us on every hand in this depression is that it is a surplus crisis, not a deficit depression, the first in human history; and that we live, whether we understand it or not, in a new era in which our sole problem is the use of the surplus that our unlimited productive power provides, not the painful accumulation of a surplus out of postponed consumption and penurious economy so that we may sometime be able to barely meet the needs of an ever-increasing population. The continuous expansion of our consumptive power, individual and collective, is the crux of the economic problem that confronts every advanced and fully developed industrial nation, nowhere more acutely than in this country. The problem of producing goods has become subordinate to that of manufacturing consumers, and this is a problem of the wise and effective and free use of our surplus in ways which enhance the public or community welfare. It requires not only that we steadily expand the purchasing power of that overwhelming proportion of the consumer public who spend most of their income and buy most of the goods and services that business sells and out of which it secures its profits; we must also establish their sense of security as consumers and develop their purchasing disposition by reconstructing their confidence and rebuilding—their belief in the possibility and soundness of an ever-rising standard of living."

Air Conditioning and Rock Products

We would much rather be in the rock products industry than in the lumber industry. The rock products industry has, so far as we can see, a limitless unexplored future. In the same future, on the other hand, trees are likely to be grown and valued for esthetic reasons, or for pulp wood, rather than for structural materials. The era of the combustion-inviting "balloon-frame" wooden house and commercial building is passing rapidly. The era of the rock products building is just beginning. It will not necessarily be the type of rock products construction we are now familiar with. But the structural materials of the future will spring largely from rock products raw materials.

The new industry of air conditioning will bring about the change. Houses, dwellings of all kinds, office buildings, factories, etc., where people live and work will be artificially heated, cooled and ventilated with pure, fresh air, from which dust, smoke and germs will have been eliminated. Maybe the air will be "oxygenized" or "ozoned" to give us even more pep and ambition.

Air conditioning means that the building must be insulated. Various rock products are the answer to economical, fireproof, vermin-proof insulation problems. A variety of rock products have been and are being developed to supply the need. Slag wool, rock wool, gypsum and concrete products, vermiculite (an interesting rock products of the mica variety found now in Montana and Colorado), pumice, volcanic ash, diatomaceous earth, etc., are among the rock products minerals used.

Impure limestone, not fit to make lime, is the mineral from which rock wool is made. Also it may be made from pure limestone, silica and alumina in the correct proportions. The raw materials are melted to a slag, and air or steam is blown through this slag.

Vermiculite deposits are comparatively rare, but doubtless human ingenuity will discover ways and means of making an artificial product of similar properties. Cement was once a natural product, but artificial preparation through scientific experiment and research have vastly improved it. Doubtless the same will prove true of some of these newer rock products.

Commercially the field opened by these new rock products is immense. Just let one or two air-conditioned, fireproof, vermin-proof, insulated houses be built in any locality. How long will it take to render every other house in that locality obsolete? Will hotel and apartment houses so built and equipped stay empty, irrespective of how many empty ones there are of the older types? Sooner or later air conditioning and insulation, and fireproof, vermin-proof construction, are going to revolutionize the building industry. Other building materials undoubtedly can and will be used, but the opportunity for rock products manufacturers is wide open.

Financial News and Comment

RECENT QUOTATIONS ON SECURITIES IN ROCK PRODUCTS CORPORATIONS

Stock	Date	Bid	Asked	*Dividend
Allentown P. C. 1st 6's[27]	8- 9-32	93	98	
Alpha P. C. com.	8- 8-32	7½	9	25c qu. Apr. 25
Alpha P. C. pfd.[2]	8- 8-32	65	80	1.75 qu. June 15
Amalgamated Phosphate Co. 6's, 1936[19]	8- 5-32	89	....	
American Aggregates com.[19]	8- 5-32	1	5	
American Aggregates pfd.[19]	8- 5-32	5	10	1.75 qu. Jan. 1
Amer. Aggr. 6's, w. w.[19]	8- 5-32	32	36	
Amer. Aggr. 6's. ex.w.[19]	8- 5-32	30	34	
Amer. L. & S. 1st 7's[27]	8- 9-32	70	80	
American Silica Corp. 6½'s[39]	8- 9-32	No market		
Arundel Corp. com.	8- 8-32	19 actual sale		75c qu. July 1
Bessemer L. & C. Class A[4]	8- 5-32	....	2	
Bessemer L. & C. 1st 6½'s[4]	8- 5-32	11	15	
Bloomington Limestone 6's[27]	8- 9-32	....	20	
Boston S. & G. new com.[37]	8- 5-32	3	5	5c qu. July 1
Boston S. & G. new 7% pfd.[37]	8- 5-32	20	30	87½c qu. July 1
Boston S. & G. 7's 1934[19]	8- 1-32	55	60	
California Art Tile,	8- 5-32	1½	4¼	
California Art Tile,	8- 4-32	....	4	
Calaveras Cement com.	8- 5-32	....	2	
Calaveras Cement 7% pfd.[9]	8- 5-32	....	70	1.75 qu. July 15
Canada Cement com.	8- 8-32	5	5½	
Canada Cement pfd.	8- 8-32	39	40	1.62½ qu. June 30
Canada Cement 5½'s[42]	8- 6-32	86	90	
Canada Crushed Stone bonds[42]	8- 6-32	64	70	
Canada Crushed Stone com.[42]	8- 6-32	No market		
Certainteed Products com.	8- 8-32	1¼	2	
Certainteed Products pfd.	8- 8-32	6	34½	1.75 qu. Jan. 1
Certainteed Products 5½'s	8- 8-32	29½ actual sale		
Cleveland Quarries	8- 8-32	....	40	10c qu. Sept. 1
Consol. Cement 1st 6½'s, A[44]	8- 9-32	5	10	
Consol. Cement notes, 1941[27]	8- 9-32	No market		
Consol. Cement pfd.[27]	8- 9-32	....	50	
Consolidated Oka Sand and Gravel (Canada) 6½'s[12]	8- 6-32	70	75	
Consolidated Oka Sand and Gravel (Canada) pfd.[42]	8- 6-32	No market		
Consol. Rock Prod. com.[35]	8- 4-32	5c	15c	
Consol. Rock Prod. pfd.[35]	8- 4-32	25c	50c	
Consol. Rock Prod. units[35]	8- 4-32	½	1½	
Consol. S. & G. pfd. (Can.)	8- 8-32	....	50	50c qu. Aug. 15
Construction Mat. com.	8- 8-32	....	⅞	
Construction Mat. pfd.	8- 8-32	1	2½	
Consumers Rock and Gravel, 1st Mtg. 6's, 1948[35]	8- 4-32	25	28	
Coosa P. C. 1st 6's[23]	8- 6-32	15	....	
Coplay Cem. Mfg. 1st 6's[19]	8- 5-32	35	45	
Coplay Cem. Mfg. pfd.[47]	8- 9-32	5	10	
Dewey P. C. com.[47]	8- 9-32	75	85	
Dolese and Shepard	8- 8-32	14	16	$1 qu. Jan. 1
Dufferin Pav. & Cr. Stone pfd.	8- 8-32	....	27	1.75 qu. Apr. 1
Dufferin Pav. & Cr. Stone com.	8- 8-32	....	5	
Edison P. C. com.[47]	8- 9-32	2	5	
Federal P. C. 6½'s[19]	8- 5-32	....	75	
Giant P. C. com.[47]	8- 9-32	½	2	
Giant P. C. pfd.[47]	8- 9-32	3	6	
Gyp. Lime & Alabastine, Ltd.	8- 8-32	3¾	4	
Gyp. Lime & Alabastine 5½'s[42]	8- 6-32	54	58	
Hermitage Cement com.[11]	8- 6-32	3	6	
Hermitage Cement pfd.[11]	8- 6-32	18	22	
Ideal Cement 5's, 1943[29]	8- 6-32	75	80	
Ideal Cement com.[29]	8- 6-32	9	14	50c qu. July 1
Indiana Limestone units[27]	8- 9-32	No market		
Indiana Limestone 6's	8- 5-32	7	10	
International Cem. com.	8- 8-32	10½	11	50c qu. Mar. 31
International Cem. bonds, 5's	8- 8-32	61½ actual sale		Semi-ann. int.
Kelley Island L. & T.	8- 8-32	10⅛	11	25c qu. July 1
Ky. Cons. Stone com.	8- 8-32	....	2	
Ky. Cons. Stone pfd.	8- 8-32	....	50	
Ky. Cons. St. 1st Mtg. 6½'s	8- 8-32	10	15	
Ky. Cons. St. V. T. C.[45]	8- 5-32	1	2	
Ky. Rock Asphalt com.	8- 8-32	....	1	
Ky. Rock Asphalt pfd.	8- 8-32	....	25	
Ky. Rock Asphalt 6½'s	8- 8-32	57	62½	
Lawrence P. C.	8- 6-32	5	8	
Lawrence P. C. 5½'s, 1942[2]	8- 8-32	28	35	
Lehigh P. C. com.	8- 8-32	8½	10	
Lehigh P. C. pfd.	8- 8-32	50¼	55	1.75 qu. July 1
Louisville Cement[7]	8- 5-32	60	80	
Lyman-Richey 1st 6's, 1935[13]	8- 5-32	85	95	
Marblehead Lime 6's[4]	8- 5-32	No market		
Marbelite Corp. com.[35] (cement products)	8- 4-32	5c	50c	
Marbelite Corp. pfd.[35]	8- 4-32	50c	....	
Marquette Cement com.[47]	8- 9-32	2	4	
Marquette Cement pfd.[47]	8- 9-32	45	50	1.50 qu. July 1
Marquette Cem. Mfg. 1st 5's, 1936[46]	8- 9-32	70	....	
Marquette Cem. Mfg. 1st 6's, 1936[46]	8- 9-32	75	....	
Material Service Corp.	8- 8-32	3	9	
McCrady-Rodgers 7% pfd.[22]	8- 5-32	30	40	87½c qu. June 30
McCrady-Rodgers com.[22]	8- 5-32	5	15	75c qu. Jan. 26
Medusa P. C. pfd.[47]	8- 9-32	40	50	1.50 qu. Apr. 1
Medusa P. C. com.[47]	8- 9-32	5½	7	
Monarch Cement com.[47]	8- 9-32	55	60	
Michigan L. & C. com.[6]	8- 6-32	45	....	
Missouri P. C.	8- 8-32	6½	9	25c qu. Jan. 30
Monolith Portland Midwest com.[35]	8- 4-32	30c	40c	
Monolith Portland Midwest pfd.[9]	8- 4-32	15c	30c	
Monolith P. C. com.[9]	8- 4-32	60c	90c	40c s.-a. Jan. 1
Monolith P. C. pfd.[9]	8- 4-32	1	1¼	40c s.-a. Jan. 1
Monolith P. C. units[9]	8- 4-32	2¼	3¼	
Monolith P. C. 1st Mtg. 6's[9]	8- 4-32	35	40	
National Cem. (Can.) 1st 7's[27]	8- 9-32	80	90	
National Gypsum A com.[27]	8-10-32	....	2	
National Gypsum pfd.[27]	8-10-32	22	....	1.75 qu. July 1
National Gypsum 6's[8]	8- 9-32	55	....	
National L. & S. 6½'s, 1941[19]	8- 1-32	70	75	
Nazareth Cement com.[28]	6-10-32	3	....	
Nazareth Cement pfd.[28]	6-10-32	45	....	
Newaygo P. C. 1st 6½'s[27]	8- 9-32	74	....	
N. Y. Trap Rock 1st 6's	8- 8-32	51 actual sale		
N. Y. Trap Rock 7% pfd.[27]	8- 9-32	50	60	1.75 qu. July 1
North Amer. Cem. 1st 6½'s	8- 8-32	32 actual sale		
North Amer. Cem. com.[48]	8- 5-32	....	5	
North Amer. Cem. 7% pfd.[48]	8- 5-32	1	2	
North Shore Mat. 1st 5's[15]	8- 9-32	30	....	
Northwestern States P. C.[47]	8- 9-32	25	28	
Ohio River S. & G. com.	8- 8-32	....	8	
Ohio River S. & G. 7% pfd.	8- 8-32	....	98	
Ohio River S. & G. 6's[16]	8- 6-32	35	60	
Oregon P. C. com.[9]	8- 4-32	8	12	
Oregon P. C. pfd.[9]	8- 4-32	80	85	
Pacific Coast Aggr. com.[40]	8- 4-32	....	½	
Pacific Coast Aggr. pfd.[40]	8- 4-32	....	1	
Pacific Coast Aggr. 6½'s, 1944[5]	8- 4-32	10	12	
Pacific Coast Aggr. 7's, 1939[5]	8- 4-32	2	4	
Pacific Coast Cement 6's[5]	8- 4-32	40	....	
Pacific P. C. com.	8- 5-32	3	4¾	
Pacific P. C. pfd.[5]	8- 4-32	27	32	1.62½ qu. July 5
Pacific P. C. 6's	8- 5-32	....	94	
Peerless Cement com.[21]	8- 6-32	25c	75c	
Peerless Cement pfd.[21]	8- 6-32	3	5	
Penn.-Dixie Cement com.	8- 8-32	1¼	1½	
Penn.-Dixie Cement pfd.	8- 8-32	5	10	
Penn.-Dixie Cement 6's	8- 8-32	39½ actual sale		
Penn. Glass Sand Corp. pfd.[27]	8- 9-32	40	50	1.75 qu. Apr. 1
Penn. Glass Sand Corp. 6's[19]	8- 5-32	70	75	
Petoskey P. C.	8- 8-32	¾	1½	
Port Stockton Cem. com.[9]	8- 4-32	No market		
Riverside Cement com.[9]	8- 4-32	....	10	
Riverside Cement pfd.[9]	8- 4-32	35	45	1.50 qu. Aug. 1
Riverside Cement, A	8- 5-32	....	3	
Riverside Cement, B[9]	8- 4-32	70c	1	
Sandusky Cement 6½'s, 1932-37[27]	8- 9-32	70	80	
Santa Cruz P. C. com.	8- 5-32	40	....	$1 qu. July 1
Schumacher Wallboard com.	8- 5-32	1	....	
Schumacher Wallboard pfd.	8- 5-32	3	14	50c qu. May 15
Signal Mt. P. C. pfd.[47]	8- 9-32	2	5	
Southwestern P. C. units[35]	8- 4-32	150	200	
Southwestern P. C. pfd.[47]	8- 9-32	65	70	$2 qu. July 1
Standard Paving & Mat. (Canada) com.	8- 8-32	1¾	1⅞	
Standard Paving & Mat. pfd.[42]	8- 8-32	....	29½	50c qu. Aug. 15
Superior P. C., A	8- 5-32	20	....	27½c mo. Sept. 1
Superior P. C., B	8- 5-32	4¾	10	12½c July 20
Trinity P. C. units[47]	8- 9-32	25	30	
Trinity P. C. com.[47]	8- 9-32	1	3	
Trinity P. C. pfd.[47]	8- 9-32	22	25	
U. S. Gypsum com.	8- 8-32	20½	20⅞	40c qu. Oct. 1
U. S. Gypsum pfd.	8- 8-32	90½	95	1.75 qu. Oct. 1
Wabash P. C.[21]	8- 6-32	3	7	
Warner Co. com.[16]	8- 6-32	2	2½	
Warner Co. 1st 7% pfd.[16]	8- 6-32	15	30	1.75 qu. Apr. 1
Warner Co. 6's, 1944, with war.	8- 5-32	35	40	
Whitehall Cem. Mfg. com.[30]	8- 9-32	....	80	
Whitehall Cem. Mfg. pfd.[30]	8- 9-32	....	55	
Wiscon. L. & C. 1st 6's, '33[15]	8- 9-32	25	....	
Wolverine P. C. com.	8- 8-32	½	1	
Yosemite P. C. A. com.[9]	8- 4-32	90c	1.10	

*Latest 1932 dividend.

Quotations by: [1]Watling Lerchen & Hayes Co., Detroit, Mich. [2]Bristol & Willett, New York. [3]Rogers, Tracy Co., Chicago. [4]Butler, Wick & Co., Youngstown, Ohio. [5]Smith, Camp & Riley, San Francisco, Calif. [6]Frederick H. Hatch & Co., New York. [7]J. J. B. Hilliard & Son, Louisville, Ky. [8]Dillon, Read & Co., Chicago, Ill. [9]A. E. White Co., San Francisco, Calif. [10]Lee Higginson & Co., Boston and Chicago. [11]J. W. Jakes & Co., Nashville, Tenn. [12]James Richardson & Sons, Ltd., Winnipeg, Man. [13]Stern Bros. & Co., Kansas City, Mo. [14]First Wisconsin Co., Milwaukee, Wis. [15]Central-Republic Bk. & Tr. Co., Chicago. [16]G. M. P. Murphy & Co., Baltimore, Md. [17]Citizens Southern Co., Savannah, Ga. [18]Dean, Witter & Co., Los Angeles, Calif. [19]Hewitt, Ladin & Co., New York. [20]Tucker, Hunter, Dulin & Co., San Francisco, Calif. [21]Baker, Simonds & Co., Inc., Detroit, Mich. [22]Peoples-Pittsburgh Trust Co., Pittsburgh, Penn. [23]Howard R. Taylor & Co., Baltimore. [24]Richards & Co., Philadelphia, Penn. [25]Hincks Bros. & Co., Bridgeport, Conn. [26]Bank of Republic, Chicago, Ill. [27]National City Co., Chicago, Ill. [28]Chicago Trust Co., Chicago, Ill. [29]Boettcher-Newton & Co., Denver. [30]Hanson and Hanson, New York. [31]S. F. Holzinger & Co., Milwaukee, Wis. [32]Tobey and Kirk, New York. [33]Steiner, Rouse and Co., New York. [34]Jones, Heward & Co., Montreal, Que. [35]Tenney, Williams & Co., Los Angeles, Calif. [36]Stein Bros. & Boyce, Baltimore, Md. [37]Wise, Hobbs & Arnold, Boston. [38]E. W. Hays & Co., Louisville, Ky. [39]Blythe Witter & Co., Chicago, Ill. [40]Martin Judge Co., San Francisco, Calif. [41]A. J. Pattison Jr. & Co. Ltd., Toronto, Canada. [42]Nesbitt, Thomson & Co., Toronto. [44]E. H. Rollins, Chicago. [45]Dunlap, Wakefield & Co., Louisville, Ky. [46]First Union Trust & Savings Bank, Chicago. [47]Anderson Plotz and Co., Chicago, Ill. [48]Hemphill, Noyes and Co., New York City.

Yosemite Portland Cement

THE annual report of the Yosemite Portland Cement Co., San Francisco, Calif., for the year ended December 31, 1931, states that during the year 1931 sales were more than sufficient to pay operating expenses and depreciation, and $40,979.42 was carried into the surplus account. The absence of funded debt or notes from the financial structure of the corporation is proving its value by allowing cash resources to be retained in the treasury for use in case of need.

Sales were maintained at slightly above the California average. The general consumption of cement has fallen off in line with building construction and the competition met in sales work has correspondingly increased.

The average selling value per barrel of cement was approximately $1.69 for 1931, as compared with $1.77 for 1930, or a decrease of 8c. per bbl.

The principal reason for the decrease was a price reduction of 20c. per bbl. made on June 27, 1931, and an unsettled price condition during the entire year.

In the face of a reduction in output as compared with last year, the production cost per barrel was reduced by 6%.

Total administrative and selling expenses were decreased 7% under 1930 costs.

During the year the company was granted three patents, two of which are process patents. One patent concerns color change in the cement during the manufacturing process; another protects the process for making superior high early and ultimate strength in portland cement at a lower manufacturing cost; the third patent concerns the manufacture of oil well cements for use under adverse conditions.

Unexpected success was achieved by the laboratory in the development of a portland cement for massive concrete structures where high temperatures caused by setting and hardening are encountered. This cement, having good strength and unusually low heat development in concrete, has created and held the interest of hydraulic engineers of national reputation.

The efforts of the laboratory are now being directed toward bettering these products already developed with the view to decreasing their manufacturing cost.

BALANCE SHEET OF THE YOSEMITE PORTLAND CEMENT CORP.
(As of December 31, 1931)

ASSETS

Plant properties	$1,856,645.90		
Less reserves for depreciation and depletion	320,988.68		
Remainder			$1,535,657.22
Investments, at cost			26,116.66
Current assets:			
Cash		$ 227,249.29	
Marketable securities		61,769.48	
Accounts receivable	$139,572.04		
Notes receivable	73,216.89		
Total	$212,788.93		
Less reserve for doubtful accounts & notes	7,518.53	205,270.40	
Inventories (based on physical inventories and book values; not verified as to quantities)		215,670.69	
Total current assets			$ 709,959.86
Intangible assets acquired with entire issue of class B common capital stock, and organization expenses			1,762,411.68
Deferred charges			54,340.50
Total			$4,088,485.92

LIABILITIES

Capital stock:		
Class A 8% cumulative and participating common capital stock (authorized, 250,000 shares of $10 each; issued, 234,790 shares, less in treasury, 1606 shares; outstanding, 233,184 shares)	$2,331,840.00	
Class B common capital stock (authorized, 150,000 shares of $10 each; outstanding, 140,800 shares)	1,408,000.00	
Total capital stock		$3,739,840.00
Current liabilities:		
Accounts payable	$51,414.42	
Federal income and state franchise taxes	7,401.88	
Customers' sack redemption account	2,447.90	
Total current liabilities		61,264.20
Surplus		287,381.72
Total		$4,088,485.92

Note: No dividends have ever been paid on Class A or Class B common capital stock.

International Cement Corp. Second Quarter Earnings

THE International Cement Corp., New York City, reports for the first and second quarters of 1932:

	2nd quarter 1932	1st quarter 1932
Gross sales	$3,888,693.22	$3,219,764.79
Less: Packages, discounts and allowances	847,012.79	633,747.49
Net sales	$3,041,680.43	$2,586,017.30
Manufacturing cost, excluding depreciation	$1,603,685.96	$1,350,683.38
Shipping, selling and administrative expenses	796,037.93	849,577.56
	$2,399,723.89	$2,200,260.94
Operating profit	$ 641,956.54	$ 385,756.36
Interest charges and financial expenses	173,065.13	199,735.88
Net profit before reserves	$ 468,891.41	$ 186,020.48
Reserves for contingencies, etc.	$ 127,184.68	$ 128,763.20
Reserve for depreciation	691,235.31	466,970.69
	$ 818,419.99	$ 595,733.89
Net loss	$ 349,528.58	$ 409,713.41

For six months ended June 30, 1932, net loss was $759,241 after taxes and charges, comparing with net income of $1,000,627, equal to $1.57 a share on 636,124 shares in the first half of the previous yea .

Income account for the quarter ended June 30, 1932, compares as shown below.

EARNINGS STATEMENT OF INTERNATIONAL CEMENT CORP.

	Quarter ended June 30 1932	1931	1930	1929
Gross sales	$3,888,693	$8,868,625	$9,051,66[illegible]	$9,061,789
Expenses, etc.	3,246,736	6,918,779	6,529,341	6,810,749
Depreciation	691,235	835,199	788,908	622,914
Loss	$ 49,278	*$1,114,647	*$1,733,416	*$1,628,126
Interest, taxes, contingencies, etc.	300,250	524,929	523,1[illegible]	478,338
Net loss	$ 349,528	*$589,718	*$1,210,282	*$1,149,788

	Six months, June 30 1932	1931	1930	1929
Gross sales	$7,108,457	$14,980,049	$16,291,409	$16,552,825
Expenses, etc.	6,080,744	11,797,527	12,035,628	12,441,569
Depreciation	1,158,205	1,302,825	1,27[illegible],945	1,069,283
Loss	$ 130,492	*$1,879,697	*$2,97[illegible],836	*$3,041,973
Interest, taxes, contingencies, etc.	628,749	879,070	92[illegible],074	874,565
Net loss	$ 759,241	*$1,000,627	*$2,051,762	*$2,167,408

*Profit.

Recent Dividends Announced

Cleveland Quarries (qu.)	$0.10,	Sept. 1
Consolidated Sand & Gravel pfd. (Can.) (qu.)	[illegible].50	Aug. 15
Standard Paving and Materials pfd. (Can.) (qu.)	0.50	Aug. 15
Superior Portland Cement Cl. A (mo.)	[illegible]27½,	Sept. 1
U. S. Gypsum com. (qu.)	[illegible]40,	Oct. 1
U. S. Gypsum pfd. (qu.)	[illegible]1.75,	Oct. 1

Schumacher Wall Board Corp. to Adjust Assets

AS of April 30, 1932, current assets of Schumacher Wall Board Corp., Los Angeles, Calif., were $167,367 and current liabilities $92,202, leaving net working capital of $75,165. This compares with current assets of $255,774 and current liabilities of $165,135, leaving working capital of $90,639 at the close of the previous year. While the amount of cash on hand is not shown in the last balance sheet, it is stated by the company that cash position was increased $7000 during the year, and that bank loans and purchase money obligations were reduced $71,420 during the same period.

A proposal is to be submitted to stockholders for ratification to write down certain items of organization expense, plant and machinery and to reduce the book value of gypsum deposits and to increase capital surplus. Ratification of this proposal, A. R. Moylan, vice-president, states in a letter to stockholders, will eliminate or reduce charges to capital surplus and various amortization expenses which otherwise would constitute a charge against earnings.

The following table shows accounts before and after adjustment in the event that the proposal is ratified by stockholders:

	After proposed write-down of April 30, 1932	Before proposed write-down April 30, 1932
Investments in other companies	[illegible]211,381	$260,098
Fixed assets	696.457	1,224,296
Deferred charges	35,882	145,921
Capital stock	9[illegible]0,916	1,637,512

Continued decline in the building industry has had its effect upon earnings during the past fiscal year, the letter states. Building permits in Pacific Coast territory decreased approximately 43% during the last fiscal year, which was reflected in a decline in sales volume of 38%.

Economies have been effected in all operations, it is stated. On October 1, 1931, salaries and wages were reduced. With these reductions and other operating economies, savings for the year were approximately $60,000.

In addition, similar salary and wage reductions were made in subsidiary company, Gypsum Products Corp. of Seattle, Wash., which, together with other operating economies, reduced operating expenses about $30,000 annually at that plant.

The company during the past fiscal year purchased 221 shares of preferred stock.

The comparative balance sheet, as of April 30, follows:

ASSETS	1932	1931	1930
Current assets	$ 167,367	$ 225,774	$ 304,439
Investments other companies	260,098	271,437	200,439
Fixed assets—net	1,224,296	1,310,409	1,389,277
Deferred charges	145,921	134,127	144,239
Total assets	$1,797,682	$1,971,747	$2,038,028
LIABILITIES			
Current liabilities	$ 92,202	$ 165,135	$ 99,760
Capital stock	1,637,512	1,644,041	1,727,596
Capital surplus	....	54,391	103,664
Earned surplus	67,968	108,180	107,008
Total liabilities	$1,797,682	$1,971,747	$2,038,028

Schumacher Wall Board Corp. Omits Dividend

DIRECTORS of Schumacher Wallboard Corp., Los Angeles, Calif., have omitted payment of the 50 c. dividend on the preferred stock which ordinarily would be payable August 15.

"During the last year the continued decline in the building industry has resulted in a similar decline in the company's sales volume," A. R. Moylan, vice-president and general manager, said. "In view of this fact, and the uncertainty with regard to the future, your directors believe that the interests of the stockholders will be best served by the passing of the August dividend."

Appoints Receiver for Utah-Idaho Cement Co.

THE First Savings Bank of Ogden, Utah, was appointed receiver on July 23 for the Utah-Idaho Cement Co. in connection with a complaint filed by Scholefield, Wells and Baxter, certified public accountants, for $875 judgment for audits of the firm's books alleged to have been performed.

The cement company, in an answer, admitted the truth of the complaint and consented to the receivership.

On April 1, 1931, it is alleged, first mortgage 7% sinking fund gold bonds in the amount of $250,000, secured by a mortgage on the assets of the firm, were issued. Further, it is charged, these bonds are in default and in addition the firm has debts of about $50,000 outstanding.

While the assets of the cement company are said to exceed the indebtedness, cash is not available for immediate payment nor can the assets be sold piecemeal except at a great loss while the firm is unable to borrow further funds.—*Ogden City* (Utah) *Standard Examiner.*

Recent Prices Bid and Contracts Awarded

Bellevue, Ia. Contract for 2200 cu. yd. of maintenance gravel has been awarded to the Bellevue Sand and Gravel Co. at about $1.43 per yd. on highway No. 62.

Topeka, Kan. Contract has been awarded by the city commission to A. L. Wiseman for lime at $10.75 per ton.

Circleville, Ohio. County commissioners have awarded contract to H. E. Barthelmas for 700 tons of crushed stone at $1 per ton.

Leon, Ia. Sargent Brothers, contractors who are crushing rock near Decatur, have offered to supply the town with crushed stone at $1.80 per cu. yd.

Ft. Madison, Ia. McManus Stone Co. has been awarded contract for approximately 5400 cu. yd. of crushed stone at $1.73 per yd.

Jacksonville, Ill. McGrath Sand and Gravel Co., Inc., has been given contract to supply 7000 cu. yd. of gravel on a county road at Nortonville for $1.88 per yd.

Fremont, Ohio. Stone prices recently submitted county commissioners were said to range from 75c. to 90c. per ton, with the trucking cost estimated at 5c. per ton mile.

Davenport, Ia. The Moline Consumers Co. was low bidder for furnishing sand and gravel for county road work at a recent letting. It bid 90c. per ton for sand delivered from Moline and $1.30 per ton for gravel.

Chico, Calif. Bids for 10,000 tons of crushed rock were recently rejected by the county supervisors when three companies submitted identical bids of $1.29 per ton.

Traer, Ia. Contracts for crushed rock for county road surfacing work have been awarded at from $1.49 to $1.78 per cu. yd. for class A stone. Gravel contracts have varied from $1.49 to $1.75 per cu. yd. for class A gravel.

Sand-Lime Brick Production and Shipments in July

THE FOLLOWING DATA are compiled from reports received direct from producers of sand-lime brick, located in various parts of the United States and Canada. The accompanying statistics may be regarded as representative of the industry.

Fifteen sand-lime brick plants reported for the month of July, this number being the same as the number reporting for the month of June, statistics for which were published in our issue of July 16.

Figures for the month of July indicate that production has increased somewhat as compared to the previous month. Shipments by rail also show a slight increase, while those by truck decreased somewhat. An increase is shown in stocks on hand, and a decrease in unfilled orders.

Average Prices for July

Shipping point	Plant price	Delivered
Detroit, Mich.	....	$12.50
Flint, Mich.	$11.50	13.00
Grand Rapids, Mich.	10.00	....
Milwaukee, Wis.	8.50	10.50
Pontiac, Mich.	10.50	12.50
Saginaw, Mich.	10.00	....
Sioux Falls, S. D.	....	13.00
Toronto, Ont., Can.	12.00	13.50

Statistics for June and July

	*June	†July
Production	2,215,446	3,091,749
Shipments (rail)	121,000	194,400
Shipments (truck)	2,518,423	1,926,945
Stocks on hand	3,484,764	5,152,140
Unfilled orders	6,625,000	5,820,000

*Fifteen plants reporting; incomplete, one not reporting production, one not reporting stocks on hand and seven not reporting unfilled orders. Figures revised to include one plant not reporting in time to include with previous published figures for this month. †Fifteen plants reporting. Incomplete, five not reporting unfilled orders.

Urges Higher Cement Tariff in Cuba

AMONG the sections of the tariff which President Machado has recommended be increased is Section 3 covering importation of cement which, according to the proposed act, will be raised from 50 c. per 100 kilograms to 80 c. general tariff and 72 c. for United States shipments. To this will be added a sales tax of 15 c.—*New York* (N. Y.) *Times.*

Places Samples of Road Surfacing in Ohio

THE Ohio Quartz Products Corp. of Jackson, Ohio, is now putting down samples of its bituminous street-surfacing material in several southern Ohio cities, to demonstrate the quality of the product, the *Jackson Herald* reports.

James J. Cronin, General Manager, Dolese and Shepard Co.

THE Dolese and Shepard Co., Chicago, Ill., producers of crushed stone, announces the appointment of James J. Cronin as general manager. Mr. Cronin will retain his position as president of the Consolidated Co. He is one of the best known crushed stone men in the middle west. The Dolese and Shepard Co. has a large plant at McCook, Ill., in the Chicago switching district.

Mr. Cronin in 1905 was salesman for the Western Stone Co. In 1907 he joined the Wisconsin Lime and Cement Co. and in 1915 he organized the Consolidated Co.

Marquette Installs New Barge Loading Equipment

NEW CEMENT LOADING equipment has been installed at the Peru, Ill., barge terminal operated by the Marquette Cement Manufacturing Co.

The cement is dumped from railway cars into a track hopper from which it is taken by a conveyor and carried to an elevator which lifts it 35 ft. and discharges it on to a screw conveyor mounted on a steel bridgework above the tracks.—*LaSalle* (Ill.) *Post.*

Gravel Plant Destroyed

THE CRUSHER and main buildings of the Hersey Gravel Co. six miles east of Evart, Mich., were destroyed by fire July 31.

The fire, which is believed to have started from defective wiring, originated in the crusher building and spread to the main structure, which was rebuilt and given new equipment three years ago.

The plant, which after the fire comprises only three smaller buildings, began operation 14 years ago. George Glerum, of Evart, is president of the company.—*Grand Rapids* (Mich.) *Press.*

California Quarry Makes Permanent Improvements

AT THE Deelez Quarry in South Fontana, Calif., according to Carl Bradley, superintendent, a new building, which will house the machine shop, power house, blacksmith shop and others, is under construction. A new office building is also being built and two new powder magazines. The shacks which have served as the quarry camp are being torn down and new buildings constructed at a cost of approximately $10,000. —*Fontana* (Calif.) *Herald.*

Want to Help Get Prosperity Started?

THE CHIEF DIFFICULTY in the present situation is in overcoming a lethargy which seems to beset public officials and business men alike. All seem to be waiting for someone else to start something. The time to start construction is *now*.

Why not organize Industrial Councils for Unemployment Relief in every county and city as has been done in DuPage county, Illinois? Find out how much idle public money and public credit there is available from all sources. And put it to work!

The accompanying advertisement carried in numerous county newspapers recently tells the story.

Fluorspar and Cryolite in 1931

STATISTICS on fluorspar and cryolite in 1931 have been issued by the Bureau of Mines. Besides production and shipments, prices and the various uses of the materials are discussed.

Sever Business Connections with Salesmen Using Coercion

WITHOUT DISCUSSION, the Kentucky state highway commission adopted a resolution severing all business connections with two salesmen of road materials who were alleged to have attempted to "coerce" a New Albany road contractor to buy their products.

The resolution states the commission had reliable information indicating the men had used sales methods objectionable to the commission. It stated "coercion, threats and misrepresentation of facts relative to the award of contracts" was a "handicap to free and competitive bidding."

The commission's resolution was the sequel to a turbulent session of the commission July 13 at which T. J. Atkins, New Albany contractor, charged an effort had been made to coerce him into buying rock asphalt for a higher price than he contracted for after he had entered a low bid on a Kentucky road job.—*Bowling Green* (Ky.) *Times.*

To Make Improvements

THE Benzon Fluorspar Co. of Cave-in-Rock, Ill., has enjoyed a good season to date in spite of the fact that the demand for spar is dependent largely on the steel industry and that production of steel is at 16% of capacity.

The plant at Cave-in-Rock has been operating regularly and has turned out several sizable orders. It is expected, however, to shut down in a short time to make necessary improvements.

The company plans to replace its present timber storage bin with one of concrete having 1000 tons capacity. New concentration tables are being installed. The work will be finished during the summer, according to J. W. H. Blee, in charge of the plant.

Quarry Accidents in the United States in 1930

THE BUREAU of Mines has issued Bulletin 366, which gives detailed statistics on quarry accidents in the United States during 1930.

Men Wanted!

Do you want to see those words appear in want ads again? Who does not!

It is the aim of this organization to create work. It has been learned that the State of Illinois Highway Department is delaying the letting of contracts on various highways and grade eliminations of DuPage county, totaling two millions of dollars ($2,000,000) or more. The causes for this delay are many, but none are big enough not to be overcome by public opinion.

Since the work is here, the money to pay for same in hand, and the men to do the work are ready, there is only one thing lacking—the letting of the work by the State Highway Department.

Do you want to join the movement to bring about the placing of these words:

MEN WANTED

again? Join us in our endeavor. Sixty per cent of the two million will be paid out in wages. The rest in material costs and operation expenses, we have learned.

Business men, fraternal organizations, unions, or Mr. Unemployed, write us supporting this movement.

Address letters and resolutions to your state officials.

Ask your supervisors why this work is held up.

And do it now!

It means work for hundreds now bordering on starvation!

It means eliminating many names from the long charity list!

Are you interested!

Do you want work, or to help others get work?

Write us at once in care of this newspaper or direct.

Industrial Council for Unemployment Relief of DuPage County

Box 26, LOMBARD, ILL.

Advertisement carried in county newspapers in interest of unemployment relief

Traffic and Transportation

Proposed Changes in Rates

THE following are the latest proposed changes in freight rates up to the week ending August 6:

NEW ENGLAND FREIGHT ASSOCIATION DOCKET

25927. **Limestone, agricultural, ground,** minimum weight 40,000 lb., from Dudswell or Marbleton, Que. Proposed—To Lynn, E. Billerica, Waverley (North Weston, Belmont, Waverley, Groveland, Mass., 17; Eliot, Agamenticus, Me., Winchester, N. H., Westport, West Swanzey, N. H., 16; Bennington, N. H., Montague City, Turners Falls, Mass., 16½; Penacook, Boscawen, N. H., 15½, and Chicopee Falls, Mass., 17. Reason—Same basis as currently in effect to other points on the B. & M. R. R.

26107. **Broken limestone,** minimum weight 50,000 lb., from Swanton, Vt., to Livermore Falls and Rumford, Me. Present, 27; proposed, 14. Reason—To establish rate that will enable traffic to move.

26194. **Limestone, broken, crushed or ground,** minimum weight 50,000 lb., from Ashley Falls and Lee, Mass., to various B. & Ar. R. R. stations, representative points in Maine shown below:

	Prop.	Pres.		Prop.	Pres.
Caribou	32½	38½	St. Francis	34½	42
Ft. Fairfield	32½	38½	La Grange	24½	31
Houlton	28½	3[illegible]			

Reason—To establish rates to stations named comparable with rates currently effective to other stations on the B. & Ar. R. R.

TRUNK LINE ASSOCIATION DOCKET

29570. **Limestone, unburned, ground,** carloads, minimum weight 50,000 lb., from Rosendale, N. Y., to Paterson, N. J., 10½c per 100 lb. Present rate, 14c. Reason—Proposed rate is comparable with rates to Weehawken and Paterson, N. J.

29573. **Crushed stone,** carloads (See Note 2), from Auburn, N. Y., to Dushore, Penn., $1.20 per net ton. Reason—Proposed rate is comparable with rate from Oaks Corners, N. Y.

29583. **Limestone, unburned, ground,** carloads, minimum weight 50,000 lb., to stations on the Catskill Mountain Branch of the N. Y. C. R. R., Stony Hollow, Pine Hill, Roxbury, Hobart, E. Meredith, Oneonta, Tannersville, Hunter and various, from Rosendale, N. Y., rates ranging from $1.20 to $2.20, and from West Athens, N. Y., rates ranging from $1.40 to $2.20 per net ton. (See Note 5.)

29589. **Glass sand,** carloads (See Note 2), and **ground flint,** carloads, minimum weight 40,000 lb., from Hancock, Berkeley Springs, Great Cacapon, W. Va., and Cumberland, Md., to Ravenswood and New Haven, W. Va., $2.40 per net ton. Reason—Proposed rate is comparable with rates to Huntington, W. Va., and Zanesville, O.

29590. **Limestone, unburned, ground,** carloads, minimum weight 50,000 lb., from Rosendale, N. Y., to Kings Bridge, Morris Heights, High Bridge, Melrose Junction, Westchester Avenue and Port Morris, N. Y., and Claremont Park, Fordham, Williamsbridge, Woodlawn and Mount Vernon, N. Y., $2.20 per net ton. (See Note 5.)

29611. **Sand, zircon, crude,** carloads, minimum weight 56,000 lb., from New York, N. Y., Brooklyn, N. Y., New York, including litherage and Weehawken, N. J., to Buffalo, Niagara Falls and Suspension Bridge, N. Y., 19½c per 100 lb. Reason—Proposed rate is comparable with rate on spelter and silicon carbide from New York, N. Y., to Buffalo, N. Y.

29614. **Crushed stone,** carloads (See Note 2), from Bethlehem, Penn., to C. N. J. & N. Y. & L. B. R. R. stations. Rates ranging from 60c to $1.60 per net ton. (See Note 5.)

29615. **Stone, natural** (other than bituminous asphalt rock), **crushed, coated with oil, tar or asphaltum,** carloads (See Note 2), the oil, tar and/or asphaltum not to exceed 10% by weight of the commodity as shipped, from Syracuse, N. Y., to stations on the Erie Railroad—Suffern, W. Cornwall, Pine Bush, Middletown, Callicoon, Binghamton, Waverly, Campbell, Geneseo, Industry, Warsaw, Cuba, Limestone, Salamanca, West Salamanca, West Perrysburg, Dunkirk, Hamburg, N. Y., and various. Rates ranging from $1.40 to $2.10 per net ton. (See Note 5.)

29616. **Stone, natural** (other than bituminous asphalt rock), **crushed,** carloads (See Note 2), from South Amsterdam, N. Y., to Reynolds, Schaghticoke, West Valley Falls, Johnsonville, Buskirk and East Buskirk, N. Y., $1.15 per net ton. Reason—Proposed rate is compared with rate to Coxsackie, Mohawk and Chatham, N. Y.

29617. **Crushed stone,** carloads (See Note 2), from Bethlehem, Penn., to D. & H. R. R., N. Y. O. & W. Ry. and L. & N. E. R. R. stations—Moosic, Carbondale, Penn., Port Jervis, N. Y., Park Place, Snyders, Germans, Pen Argyl, Penn., Lewisburg, N. J., Nazareth, Salyorsburg, Allentown, Penn., and various. Rates ranging from 60c to $1.75 per net ton. (See Note 5.)

29619. **Crushed stone** (coated or not coated), carloads (See Note 2), from LeRoy, N. Y., to Springwater, N. Y., 65c per net ton, subject to 6c emergency charge. To expire December 31, 1932. Reason—Proposed rate is comparable with rate to Hemlock, N. Y.

29620. **Stone, natural** (other than bituminous asphalt rock), **crushed,** carloads (See Note 2), from Watertown, N. Y., to Ogdensburg, N. Y., 90c per net ton. To expire December 31, 1932. (See Note 5.)

29622. **Crushed stone,** carloads (See Note 2), from Jamesville and Rock Cut, N. Y., to Jessup, Penn., $1.50 per net ton. (See Note 5.)

29623. **Limestone** (finely ground), carloads, minimum weight 50,000 lb., from Annville, Penn., to Harrison, N. J., 12½c 100 lb. Reason—This proposal only changes the minimum weight, which is the usual minimum on ground limestone within Trunk Line territory.

Note 1—Minimum weight marked capacity of car.

Note 2—Minimum weight 90% of marked capacity of car.

Note 3—Minimum weight 90% of marked capacity of car, except that when car is loaded to visible capacity the actual weight will apply.

Note 4—Reason—To meet motor truck competition.

Note 5—Reason—Proposed rates are comparable with rates on like commodities for like distances, services and conditions.

CENTRAL FREIGHT ASSOCIATION DOCKET

32379. To establish on **sand and gravel,** in open top cars, carloads, Sandusky, O., to Crestline, O., rate of 75c per net ton. Present—100c.

32380. To establish on **molding sand,** carloads, from Detroit, Mich., to Saginaw, Mich., rate of 164c per net ton, subject to emergency tariff. Present—15c (6th class).

32407. To establish on **crushed stone,** carloads, from Monon, Ind., to Buchanan, Three Oaks and Niles, Mich., rate of 95c per net ton plus emergency charge. Present, 101c.

32408. To establish on **gravel** and/or **crushed stone** to which has been added oil, tar or asphalt in the amount to form more than 2% but not more than 9% of the whole mixture, carloads, from Miamiville, O., to points in Kentucky, rates as shown in Exhibit B attached.

32410. To establish on **sand, lake, river, and bank; sand, ground,** from Silica or Pebble Rock; sand, loam, carloads, from Milwaukee, Wis., to Toronto, Ont., rate of $3.65 per net ton. Present—Classification basis.

32415. To establish on **sand** (except blast, core, engine, filter, fire or furnace, foundry, glass, grinding or polishing, loam, molding or silica), and **gravel,** carloads, from Wolcottville, Ind., to Michigan City, Ind., rate of 100c per net ton via Wab. Ry., Dillon, Ind., N. Y. C. & St. L. R. R. Present, 15c (sixth class).

EXHIBIT B

From Miamiville, Ohio, to representative points in Kentucky. Rates in cents per net ton.

	Delivery line	Proposed rate GC 1805 plus 20c	Present rate	Route
Rosedale Park	L. & N.	120	135	1
Grant	L. & N.	125	150	1
Morning View	L. & N.	135	150	1
Boyd	L. & N.	160	180	1
Poindexter	L. & N.	170	190	1
Bryant	L. & N.	210	210	1
Winchester	L. & N.	220	220	1
Onconta	C. & O.	135	150	2
New Richmond	C. & O.	135	150	2
Willow Grove	C. & O.	150	160	2
Maysville	C. & O.	180	190	2
Devon	Sou.	135	140	3
Richwood	Sou.	135	150	3
Bracht	Sou.	140	160	3
Mason	Sou.	160	170	3
Corinth	Sou.	160	180	3
Sadieville	Sou.	170	190	3
Georgetown	Sou.	190	210	3
Lexington	Sou.	*220	220	3
Versailles	Sou.	210	220	3

Route No. 1—Cincinnati, O., L. & N.
Route No. 2—Cincinnati, O., C. & O.
Route No. 3—Cincinnati, O., Sou.
*10c below the GC 1805 scale, plus 20c per ton.

32471. To establish on **slag, crude, granulated,** crushed or commercial, in bulk, in open top cars, in straight or mixed carloads, from Hamilton, O., to Xenia, O., rate of 70c per net ton, plus emergency charge. Present, 12c, plus emergency charge.

32472. To establish on **crushed stone,** in bulk, in open top cars, carloads, from Bloomville, O., to Mansfield, O., rate of 50c per net ton, via P. R. R. Present, 60c.

32474. To establish on **furnace slag,** carloads, from Buffalo, N. Y., to Cambridge Springs, Millers and Mill Village, Penn., rate of 110c per net ton. Present, 150c.

32476. To establish on **sand** (other than blast, core, engine, filter, fire or furnace, foundry, glass, grinding or polishing, loam, molding or silica) or **gravel, crushed stone and furnace slag,** carloads, from Buffalo, N. Y., to Concord and Union City, Penn., rate of 100c per net ton. Present, 110c.

32477. To establish on **agricultural limestone,** carloads, minimum weight 60,000 lb., from Woodville and Gibsonburg, O., to representative points, viz., N. Y. C. R. R., *Vistula, *Elkhart, 192c; *Mishawaka, *LaPorte, †Olivers, †North Liberty, Ind., 197c. P. R. R., LaPaz Jct., Lakeville and South Bend, Ind., 197c per net ton. Present, N. Y. C. R. R., to Vistula, Elkhart, Mishawaka, 200c; LaPorte, Ind., 220c; Olivers, North Liberty, Ind., 200c. P. R. R., to LaPaz Jct., Lakeville and South Bend, Ind., 200c per net ton.

*Via P. R. R., Toledo, O., N. Y. C. R. R.
†Via P. R. R., Hamlet, O., N. Y. C. R. R.

32479. To establish on **stone, crushed** (in bulk), **crushed stone screenings** (in bulk) and **limestone, unburned, agricultural** (in bulk, in open top cars), carloads, from Genoa, Martin and Marblehead, O., to points in Indiana and Ohio, rates as shown in Exhibit A attached.

EXHIBIT A

From Genoa and Martin, O., to representative points

	Prop.	Pres.
Bryan, O.*	95	100
Ligonier, Ind.*	115	(6)
New Carlisle, Ind.*	135	(6)
Schneider, Ind.*	165	(6)
Michigan City, Ind.†	155	(6)
Francesville, Ind.†	165	(6)
Brookston, Ind.†	175	(6)
Milford Jct., Ind.‡	125	(6)
Bolivar, Ind.‡	145	(6)
Marion, Ind.‡	155	(6)
Kingsland, Ind.**	135	(6)
Crown Point, Ind.**	165	(6)
Sidney, Ind.¶	125	(6)
Kokomo, Ind.¶	145	(6)
Stillwell, Ind.¶	145	(6)
Hartford City, Ind.¶	155	(6)
Sycamore, Ind.¶	145	(6)
La Otto, Ind.***	115	(6)
Plymouth, Ind.***	135	(6)
Woodburn, Ind. (a)	110	(6)
New Paris, Ind. (a)	125	(6)
Gary, Ind. (a)	155	(6)

From Marblehead, Ind., to representative points

	Prop.	Pres.
Waterloo, Ind.*	125	(6)
Elkhart, Ind.*	145	(6)
Gary, Ind.*	175	(6)
Ft. Wayne, Ind.*	135	(6)
Monon, Ind.†	185	(6)
Shelby, Ind.†	195	(6)
Claypool, Ind.‡	155	(6)
Alexandria, Ind.‡	175	(6)
Huntington, Ind.**	145	(6)
De Long, Ind.**	165	(6)
Red Key, Ind.¶	135	(6)
Cassville, Ind¶	165	(6)
Bluffton, Ind.¶	135	(6)
La Otto, Ind.***	125	(6)
Andrew Yard, Ind. (a)	135	(6)

(6) Sixth class. *Via N. Y. C. R. R.; †via C. I. & L. Ry.; ‡via C. C. C. & St. L. Ry.; **via Erie Ry.; ¶via N. Y. C & St L. R. R.; ***via P. R. R., and (a) via Wabash Ry.

32480. To establish on **stone, crushed, and crushed stone screenings** (in bulk, in open top cars), carloads, from Painesville and Perry, O., to Cleveland, O., rate of 60c per net ton. Present, 80c.

32483. To establish on **sand** (except blast, core, engine, filter, fire or furnace, foundry, glass, grinding or polishing, loam, molding or silica) and **gravel**, carloads, from Peru, Ind., to Walkerton, Ind., rate of 60c per net ton, subject to emergency charge, to expire December 31, 1932. Present rate, 76c, subject to emergency charge.

32486. To establish on **crushed stone; limestone, unburned, agricultural; limestone screenings, agricultural, in bulk, in open top cars,** carloads, cubical or visible capacity, actual weight will apply, from Maple Grove, O., to Wadsworth, O., rate of 80c per net ton via P. R. R., Mansfield, O., Erie R. R. Present rate, 115c.

32504. To establish on **crushed stone,** Monon, Ind., to Eau Claire, Mich., 115c per net ton. Present, 12c.

ILLINOIS FREIGHT ASSOCIATION DOCKET

3330-Q. **Sand and gravel**, carloads (See Note 1), from Chillicothe, Ill., to Cameron, Ill. Present, 88c per ton (plus emergency charge of 6c). Proposed, 80c per ton (plus emergency charge of 6c per ton).

6749. **Sand and gravel,** carload (See Note 3), but not less than 40,000 lb., from Ottawa-Utica district to Lincoln, Ill. Rates per net ton: Present, $1.39; proposed, $1.30.

3339. **Gravel and/or sand, coated or treated with oil, tar or asphaltum,** between points in I. R. C. territory. Present, no commodity rates; proposed, same rates as apply on crushed stone, coated with tar or asphaltum.

SOUTHWESTERN FREIGHT BUREAU DOCKET

25308. **Limestone, agricultural,** from Rock Hill, Mo., to points in Missouri. To add Rock Hill, Mo., as a point of origin in Item 1105-H, W. T. L. Tariff 91-F, applying on limestone, agricultural (for land fertilizer purposes only), carloads (See Note 3). In no case shall the minimum weight be less than 40,000 lb. It is contended that the present bases of rates are prohibitive and it is therefore desired to place Rock Hill on the same basis as other producing points in Missouri shown in above item.

WESTERN TRUNK LINE DOCKET

4781-K. **Rock, asphalt, natural or coated,** with not to exceed 5% of road oil, crushed or ground, carloads; **stone,** coated with not to exceed 5% of road oil, **crushed or ground,** carloads, from Kansas City, Mo., and Pixleys, Mo., to points in Kansas. Rates: Present—Class rates. Proposed—Distance scale of rates prescribed in I. C. C. Docket 23094 and Sub. 1, which has been extended to apply between points in S. W. F. B. territory as published in Southwestern Lines' Tariff No. 162-D for single and joint line application based on short line distances. Minimum weight: Present—40,000 lb. Proposed—(See Note 3).

4781-L. **Stone, crushed, asphalt coated,** carloads, as described in Item No. 926-D of Sup. No. 44 to W. T. L. Tariff No. 91-F, and Item No. 1050-D of Mo. Pac. Tariff No. 6172-E, from Kansas City, Mo., and Pixleys, Mo., to stations in Missouri. Rates: Present—Class rates. Proposed—Publish from Kansas City, Mo., and Pixleys, Mo., to points in Missouri the joint line mileage scale of rates shown in Item No. 926-D of W. T. L. Tariff No. 91-F, also publish the single line scale of rates from Pixleys, Mo., to stations in Missouri as published in Item No. 1050-D of Mo. Pac. Tariff 6172-E. Minimum weight: Present—40,000 lb. Proposed—(See Note 3), but in no case shall the minimum weight be less than 40,000 lb.

4781-L. **Stone, crushed, asphalt coated,** carloads, as described in Item No. 926-D of Sup. No. 44 to W. T. L. Tariff No. 91-F, and Item No. 1050-D of Mo. Pac. Tariff No. 6172-E, from Kansas City, Mo., and Pixleys, Mo., to stations in Missouri. (See preceding announcement.)

6979-C. **Sand, silica, pumice and ash, volcanic** (See Note 1), but not less than 60,000 lb., except where car of less than 60,000 lb. capacity is furnished at carrier's convenience, the marked capacity of car will apply. From Calvert, Kan., to Chicago, Ill. Rates: Present—23½c per 100 lb. Proposed—23c.

Sup. 1 to 8024. **Rock, silica sand, ground and powdered,** carloads (See Note 3), in no case shall the minimum weight be less than 40,000 lb., from Ottawa-Utica, Ill., district to Omaha, Neb. Rates: Present—15½c per 100 lb. Proposed—270c.

Sup. 2 to 8024. **Silica, carloads,** minimum weight 40,000 lb., from Cox, Elco, Jonesboro, Kaoline, Mill Creek, Mountain Glen, Murphysboro, Olive Branch, Tamms and Whitehouse, Ill., to Kansas City, Kan.-Mo. Rates: Present—511c per net ton. Proposed—270c.

8067. **Sand, silica, crude,** in open top cars, for precessing and reshipment, minimum weight 100,000 lb., except when a car of less capacity is furnished marked capacity to govern, from Maiden Rock, Wis., to Browntown, Wis. Rates: Present—$1.90 per net ton combination on La Crosse, Wis. Proposed—$1.

Proposed I. C. C. Decisions

25124. Cement. Dewey Portland Cement Co. vs. A. T. & S. F. et al. By Examiner C. Garofalo. Rates, cement, Dewey, Okla., to certain Texas destinations found applicable. Rate to Dumas was not and is not unreasonable; rates on shipments to Seagraves between February 25, 1930, and January 11, 1932, inclusive, on shipments to Henderson, Petrolia and Wellington between February 25, 1930, and April 13, 1932, and to Cross Plains between February 25, 1930, and May 15, 1932, were unreasonable to the extent they exceeded 30 c. to Seagraves, 22 c. to Henderson, 24 c. to Petrolia, 24.5 c. to Wellington and 28 c. to Cross Plains; rates charged on shipments to Byers and Stamford since February 25, 1930, were, are and for the future will be unreasonable to the extent they exceeded, exceed or may exceed 23.5 and 27 c. respectively. Recommends reparation.

Chicago Switching Rates

ARGUMENTS, on brief, have been filed in No. 19610, switching rates in the Chicago switching district, in which the shippers substantially take the ground that rates in the district are now so high as to constrain shippers to use trucks and other substitutes for rail carriage, although they prefer the latter. Attorneys for the complainants in No. 24940, Acme Steel Co. et al. vs. A. T. & S. F., a case closely allied with the switching rates proceeding, contend that the carriers, on rehearing in No. 19610, have failed to make out a case under section 13. They said that for the record to provide a proper basis for a section 13 order there must be proof that the intrastate rates were less than the maximum reasonable rates. They asserted that the intrastate rates were not too low, the intrastate feature of the case being the only one under consideration in the reopened proceeding. They asserted that there was no proof that state traffic was unduly preferred or interstate traffic unduly prejudiced.

The railroads, in their brief, said that the commission should find that an increase in the Illinois state switching rates and the Indiana state switching rates within the Chicago district would produce additional income necessary to prevent undue burden upon the carriers' interstate revenues and would aid in maintaining an adequate transportation system. They asked for findings and an order bringing the Illinois and Indiana state rates and minimum weights to the level of the rates and minima ordered by the commission in the interstate phase of the case.

In behalf of the Illinois and Indiana commissions it was asserted that this move to increase Chicago district switching rates, both state and interstate, was an outcome of the commission's decision in Jones-Laughlin Steel Corp. vs. Baltimore and Ohio, 96 I.C.C. 682. But for that proceeding, they said, no movement to increase switching rates would have been made originally by the carriers.

Briefs in addition to those mentioned have been filed in behalf of the Board of Trade of the City of Chicago, the Chicago Stone Producers' Association, and the Grasselli Chemical Co. The last mentioned said it did not believe that the carriers had made a section 13 case such as to warrant the commission in setting aside the judgment of the state regulatory bodies. Therefore it asked that the proceeding be discontinued.

The brief in behalf of the Chicago Stone Producers' Association pointed out that in recent years practically all the movement of stone in the district had shifted from rail to truck. It said that on the three most important jobs in the city of Chicago, namely, the new Marshall Field building, the new post-office building, and the C. B. & Q. elevation, where a large amount of stone was used, it was moved by truck.—*Traffic World.*

Gets Injunction Against Lower Freight Rates in Mississippi

A TEMPORARY injunction restraining the Mississippi Railroad Commission from placing into effect a recently ordered 10% freight rate reduction on the basis of the two-line scale for interstate shipments of sand and gravel has been issued in the Hinds county chancery court.

The petition for the restraining order was filed by the Gulf, Mobile and Northern railroad, acting as agent for several other carriers, and asked that the rate reduction be set aside and that the old one-line rate stand, pending further court action when the temporary injunction will either be made permanent or dissolved.

Circuit Judge Wiley H. Potter, acting chancellor in the absence of Chancellor V. J. Stricker, granted the temporary enjoiner.

The railroad's petition contended that the commission "had not complied with legal requirements" in ordering the new rate. The further contention was made that the commission had failed to act on counter petition filed by the carriers seeking the retention of the old one-line rate.

It also was charged that the new two-line rate carrying a 10% reduction for single line shipments favored sand and gravel shippers along the Illinois Central system.

The railroad commission last December, after numerous hearings, placed into effect a one-line rate on all shipments of sand and gravel within the state.

At a recent meeting the one-line rate was abandoned and the old two-line rate reestablished, less a 10% reduction on single line movements and a 10 c. per ton differential on joint line movements. It was against the two-line rate, which was to have become effective July 15, that the restraining order was issued.—*Jackson* (Miss.) *News.*

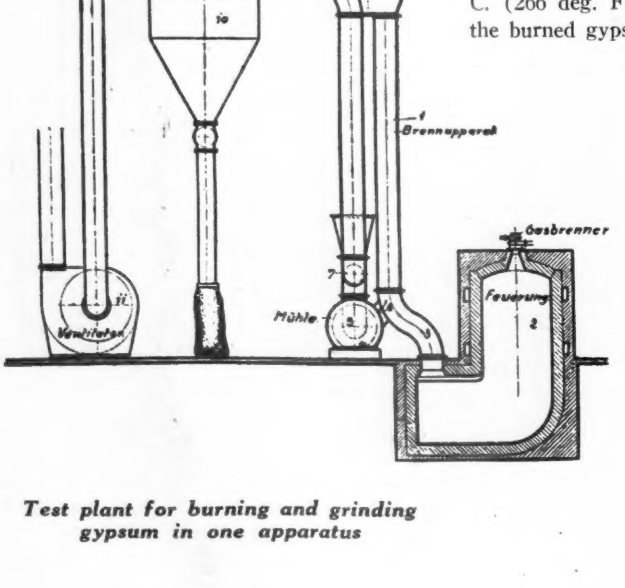
Foreign Abstracts and Patent Review

Burning and Grinding Gypsum in One Apparatus. E. Schneider describes a new kind of process for burning stucco and modeling gypsum. The crusher and burner are combined in one unit in which the combustion gases required for burning are at the same time used as conveying agent of the gypsum from and to the mill. The raw gypsum is delivered to a primary crusher to be crushed to 20 to 25 mm. (0.8-1 in.) size. It is then delivered to the pneumatic rapid-combustion plant. The burned stucco gypsum is discharged from the apparatus in its primary cyclone. This cyclone is so arranged that the stucco gypsum can be delivered directly into the finish silos.

The idea of the patented Buettner-Rema-Rosin pneumatic closed-circuit dryer conveying and drying the wet material in suspension by using hot gases at high velocity in a tube system, provided with a screening system for gradual elimination of the finer material, was adopted because the hydrate water of stucco gypsum is split off at comparatively low temperatures (theoretically at around 107 deg. C. or 225 deg. F.), and because a meal product is wanted. In the system as adapted, no overburned or raw particles are produced as long as the flue-gas temperature and the fineness of the finished material are maintained. The coarse material is returned repeatedly from the cyclone, by the flue gases, to the mill until it has been reduced to the desired fineness.

In the plant shown in the accompanying sketch, the actual burning apparatus consists of three vertical tubes (1) through which pass the combustion gases required for burning and conveyance of the material. In the test plant the combustion gases are produced in a gas burner (2) and enter the gypsum burner at (3). The raw gypsum is supplied through a feeder (4) to the mill (5) which propels the gypsum into the burner besides reducing the coarse material ejected from the separator. At (6) the material is propelled into the rising branch of the burner and after passing through the pipe, enters the separator (7); the action of this separator is based in this case on the fact that the large particles of gypsum are as a result of their live force ejected from the sharply diverted stream of gas. The screening damper (8) is claimed to permit a more or less fine adjustment of the separator. All coarse particles of gypsum are eliminated in the separator and returned by way of the connecting socket (9) to the mill. The circuit from mill to burner to separator is continued by the particles until they have been sized sufficiently and on account of their fineness burned through to their core. The fine material is removed from the flue gas current by the cyclone (10). Finally the flue gases are delivered to a dust chamber by the exhauster (11) which produces the pneumatic conveying energy required for the flue gases and gypsum.

The pipe of the test plant has a diameter of 250 mm. (9.8 in.) and is 15 m. (49 ft.) long. About 850 to 900 kg. (1870-1980 lb.) raw gypsum is burned per hour, corresponding to about 700 to 725 kg. (1540-1595 lb.) finished gypsum. The flue gas temperature entering the burner is 800 deg. C. (1472 deg. F.), and leaving the burner is 130 deg. C. (266 deg. F.), while the temperature of the burned gypsum is 125 deg. C. (257 deg. F.). The gypsum was burned to a residual water content of 5.01%. In spite of the very short period of burning, a maximum of 10 sec. (figured for the entire apparatus), the hydrate water was split off.



Test plant for burning and grinding gypsum in one apparatus

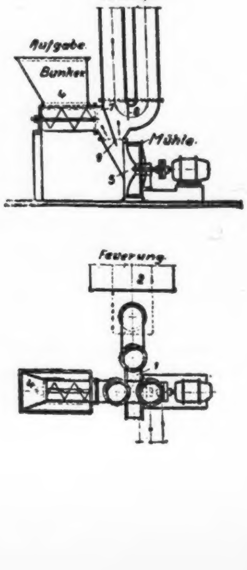
Examination of specimens of the gypsum produced showed an average of 1.10% foreign substances, 97.10% semi-hydrate and soluble anhydrite, 0.60% overburned material, and 1.20% unburned material. Strengths of the gypsum produced soon after the plant was put in operation were as follows:

Storage in air	Strengths, kg. per sq. cm. Tensile	Compressive
After 1 day	13.5	77
After 3 days	19.4	85
After 7 days	23.6	148

This material had a time set of only 10 min., but the specimens drawn by the author later showed a time of set of 28 to 30 min.

Per 1000 kg. (2200 lb.) stucco gypsum, 19.5 hp. was required for the entire burning and pulverizing apparatus, including mill, exhauster, feeding screw, and motor drive for the gate below the cyclone. It is expected that for larger plants the power consumption per ton will decrease. The gas temperatures are more favorable, being 800 deg. C. (1472 deg. F.) at the inlet, and 130 to 135 deg. C. (266-275 deg. F.) at the outlet in this plant, as compared to 700 deg. C. (1292 deg. F.) at the inlet and 150 to 170 deg. C. (302-338 deg. F.) at the outlet in rotary kilns. Moreover, better insulation can be provided here than in rotating kilns; a fuel consumption of 48 kg. (106 lb.) coke of a heating value of 7500 calories per kg. (13,500 B.t.u. per lb.) may therefore be attained.—*Tonindustrie-Zeitung* (1932) **56,** 7, pp. 93-96.

Gypsum Burning and Crushing Plant. Pikallo describes drying and crushing equipment for a gypsum plant, as built by Humboldt, which completes in one continued operation, heating of the raw gypsum, its conversion into stucco gypsum, fine grinding and pneumatic delivery. The advantages are stated and sections of several gypsum plants shown. A section of the Humboldt plant, shown in Fig. 1, shows the reserve bin (1), with discharge (2), pipe line (4), mill (3), hot-air current duct (5) from furnace, path of hot air flow (6), duct with air column and fine ground material (7), discharge (8).



Due to special design of the lining in pipe line (7) and (8), the fine material is always thrown into the air flow of the pipe and the coarse material returned to the mill. As a result of immediate removal of fine raw material, the length of the tube mill has been shortened from a customary length of 10 to 13 m. to one of 3 to 5 m. (depending on hardness of material).

Further equipment includes pipe line (9), and separator (10) from which the coarse material passes through a screw conveyor (12) to the down spout (13). The fine meal is passed through pipe line (14) to the cyclone (15) where it passes to a silo beneath, while the hot air returns through pipe line (16), drawn by the high pressure fan (17), and pipe line (18) to the mill.

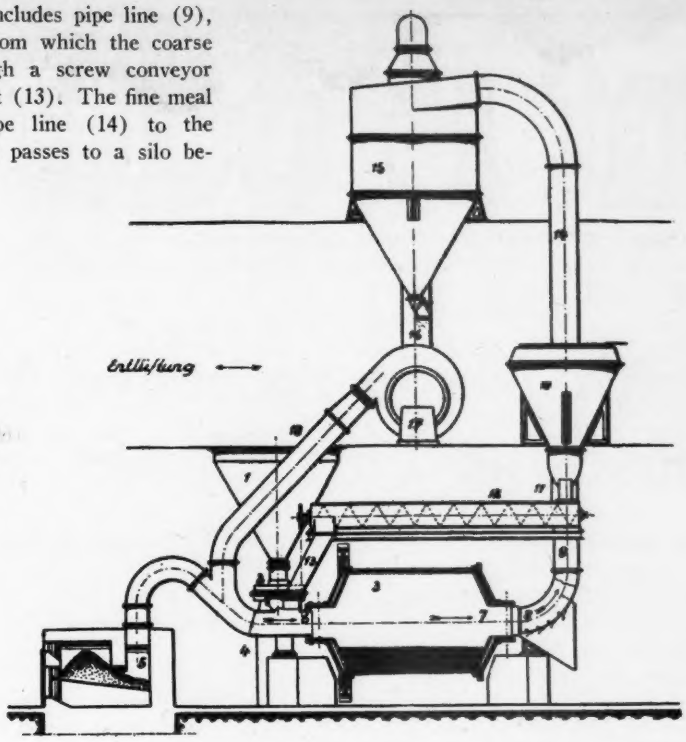


Fig. 1. Section of the Humboldt plant for drying and crushing gypsum

The production of 10,000 kg. (22,000 lb.) finished burned stucco gypsum required an amount of material corresponding to a coal consumption of 428 kg. (942 lb.) pit coal of 6500 calories per kg. (11,700 B.t.u. per lb.) The heating gas temperatures were 770 deg. C. (1418 deg. F.) ahead of the mill inlet, 520 deg. C. (968 deg. F.) at the mill inlet where mixed with mill return air, and 150 deg. C. (302 deg. F.) at the mill outlet. The finished burned and ground stucco gypsum meal had a temperature of 110 deg. C. (230 deg. F.) at the cyclone outlet. The gypsum produced has a time of set of 14 min., an average tensile strength of 14.4 kg. per sq. cm., after one day storage in air, 17.8 after 3 days storage in air and 25.2 after 7 days storage in air. Longer times of set and greater strengths have been obtained with other kinds of gypsum. The power consumption is 17.2 hp. per metric ton at a residue of 5% on the 4900-mesh (178-mesh) sieve.—*Tonindustrie-Zeitung* (1932), **56**, 16, pp. 224-227.

Combined Process for Burning Stucco Gypsum. Horst Laeger describes a combined grinding and burning process for stucco gypsum, in which the Loesche mill is used. As shown in Fig. 2, the plant comprises the gypsum rock delivery equipment (1), the hammer crusher (2), bucket elevator (3), furnace (4), charging and preheating silo (5), fly-ash discharge funnel (6), Loesche mill (7) with separator, double fan (8) for Loesche mill, cyclone (9) with dust filter, gypsum silo (10), bagging equipment (11), and gypsum delivery (12). The process was first mentioned in *Tonindustrie-Zeitung* No. 37, 1931. The hot air drawn from the furnace (4) by the fan (8) passes first to the charging silo (5) to preheat the raw material precrushed to 25 to 30 mm. size, then enters the mill (7), picking up the fine particles of gypsum which it carries from the air separator to the cyclone (9) to be extracted. A very uniformly burned gypsum is assured, by properly regulating the temperature of the hot air.—*Tonindustrie-Zeitung* (1932) **56**, 21, pp. 293-4.

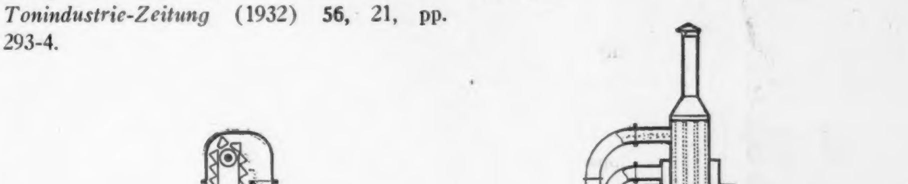


Fig. 2. A complete grinding and burning process for stucco gypsum

Recent Process Patents

The following brief abstracts are of current process patents issued by the U. S. Patent Office, Washington, D. C. Complete copies may be obtained by sending 10c to the Commissioner of Patents, Washington, D. C., for each patent desired.

Sound-Absorbing Material. This material consists of felt or a felt-like substance which supports a layer of granules of some mineral material. The glue recommended for fastening the granules to the felt is either casein glue or a pyroxylin binder. Copper or galvanized screen may be used as reinforcing. This composition may be in tile form or built up directly on the ceiling or walls. When this is done the granules may be sprayed or blown into place, or they may be put on with a trowel.—*Joseph H. Nash, Assignor to Johns-Manville Corp., New York, N. Y., U. S. Patent No.* 1,832,571.

Process of Mak'ng Artificial Stone Products. The inventor describes a block like an ordinary concrete block, but says that his process may be used for making roofing tiles, drain tiles, etc. The composition is: granulated gypsite 1%, hydrated lime, 8½%, waterproofing ½ of 1%, and vesicular aggregate 90%, and the mixture is cured as sand-lime brick is cured, but the temperature should not exceed 150 deg. C. or the gypsum will begin to turn to anhydride. The aggregate may be stone screenings or cinders. The effect of the gypsite is said to be to lower the absorption.—*Jerre Haggard, Assignor to the Atlas Lime Co., Inc., El Paso, Tex., U. S. Patent No.* 1,831,858.

Cement Products

TRADE MARK REGISTERED WITH U. S. PATENT OFFICE

Compressed Air Made to Serve Many Purposes at This Plant

New Plant of Ready Mixed Concrete Company in San Francisco, Calif.

By C. W. Geiger

WHAT is believed to be one of the most modern and efficient ready-mixed concrete plants in California was recently placed in operation in San Francisco, Calif., by the Ready Mixed Concrete Co.

Exceptional Storage Capacity

The aggregate is delivered in bottom-dump railway cars to a specially designed pit having a capacity for taking one carload. The aggregate is then taken away by a 24-in. belt conveyor and transferred to a second belt conveyor above ground. This elevates to a third conveyor which transfers at right angle to a shuttle conveyor, which in turn places the various sizes of aggregate in bunker compartments for storage. There are sixteen of these bunker compartments, each having a capacity of 150 tons.

The material is drawn off at the bottom of the storage bunkers by specially controlled gates, having remote control from the top of the bunker floor. The operator at his station when called on for certain size of aggregate presses a button controlling the gate under the particular bin compartment. As soon as the gate is opened a signal light shows on a board indicating that the gate is open and operating. As the material passes through the gate it flows to a 24-in. belt

General view of plant of Ready Mixed Concrete Co., San Francisco, Calif.

conveyor approximately 200 ft. in length. Electric motors and reduction gears are the medium for opening and closing the gates on the bottom of the storage bunkers. These are of special design, built by the Pacific Gear Reduction Co.

The bunkers are of 10-in. walls built with 4- x 10-in. plank laid flat with 4 in. of air space.

Mixing Plant

From the bunker outlets, which are in a concrete tunnel, the material is conveyed by the 200-ft. belt conveyor above ground and transferred to a secondary conveyor, which in turn takes the aggregate back over the top of the storage bunkers to the mixing plant storage bunkers, of which there are eight, each having 50 tons capacity. These bunkers are fed by a shuttle conveyor operating from the secondary conveyor. This shuttle conveyor is controlled by the operator on this floor, where is also located the remote control system for the bunker compartment gates in the tunnel.

The mixer outlet of the mixing plant storage bunkers is equipped with a special air operated gate designed and installed by Norris K. Davis Inc., of San Francisco. The operator's work consists of opening a valve which controls the gate under the desired aggregate. The material flows into a weighing hopper holding 3 cu. yd. When the load has been deposited in the weighing hopper, it is discharged through a bottom dump gate into the mixer hopper, and then into the mixer, which is an 8-4-S Davis 3-cu. yd. mixer driven by a 60-hp. electric motor, through a reduction unit.

At the same time the material is being weighed, water is also being measured and valves are opened by the Davis air system, permitting the water to flow into the concrete mixer with the aggregate. Likewise the cement is also weighed in a special cement weighing hopper having an air-operated gate, and the cement permitted to flow in a stream with the water and aggregate.

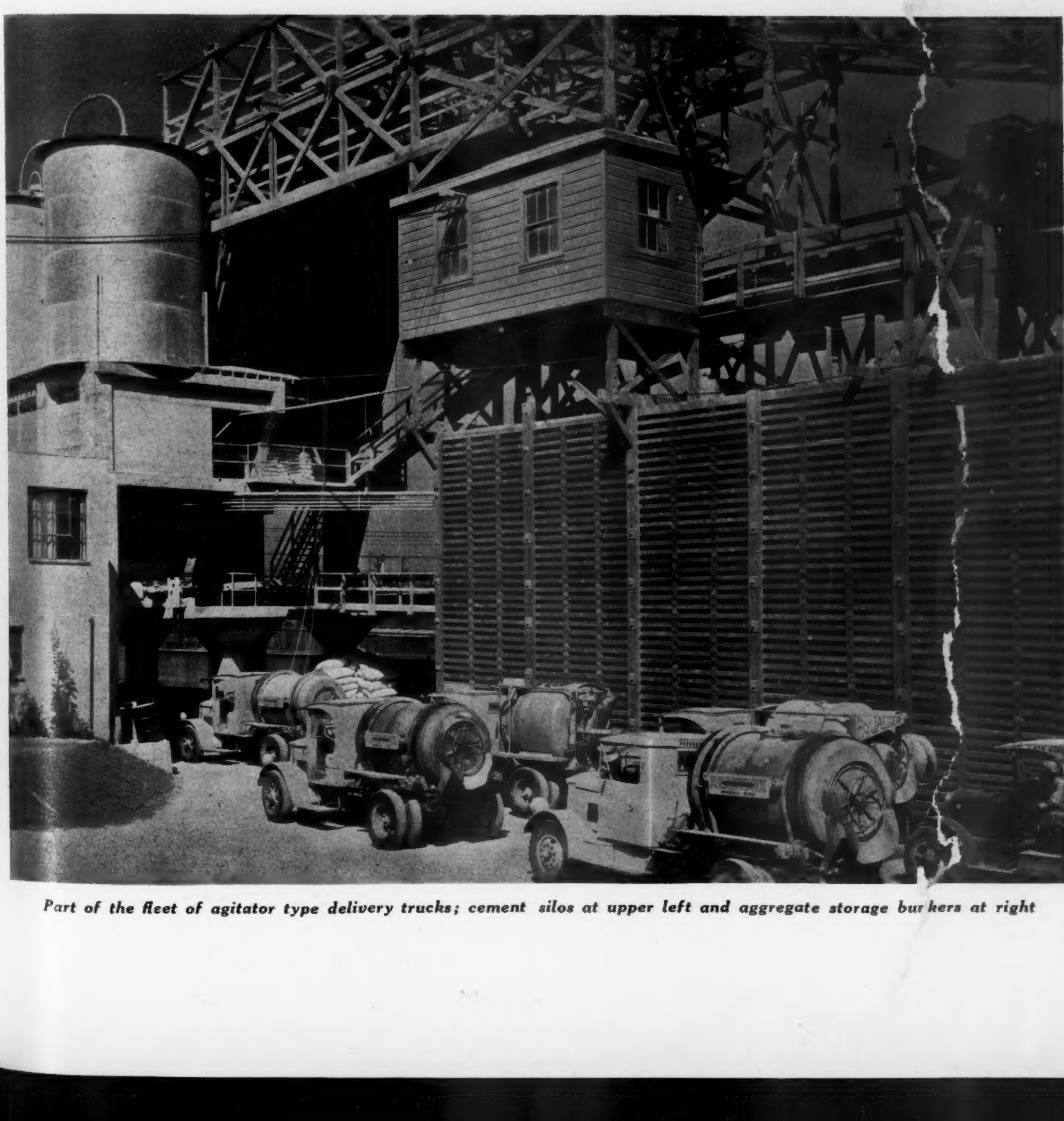
Cement is delivered in bulk and elevated to silos each having a capacity of three carloads. The Fuller-Kinyon pneumatic system is used for unloading cars and filling the silos. An Ingersoll-Rand compressor of 580 cu. ft. capacity supplies air at 65 lb. pressure for operating the various gates and levers. Davis air rams are used to manipulate all gates and levers wherever possible.

Each Batch Given Identification Number

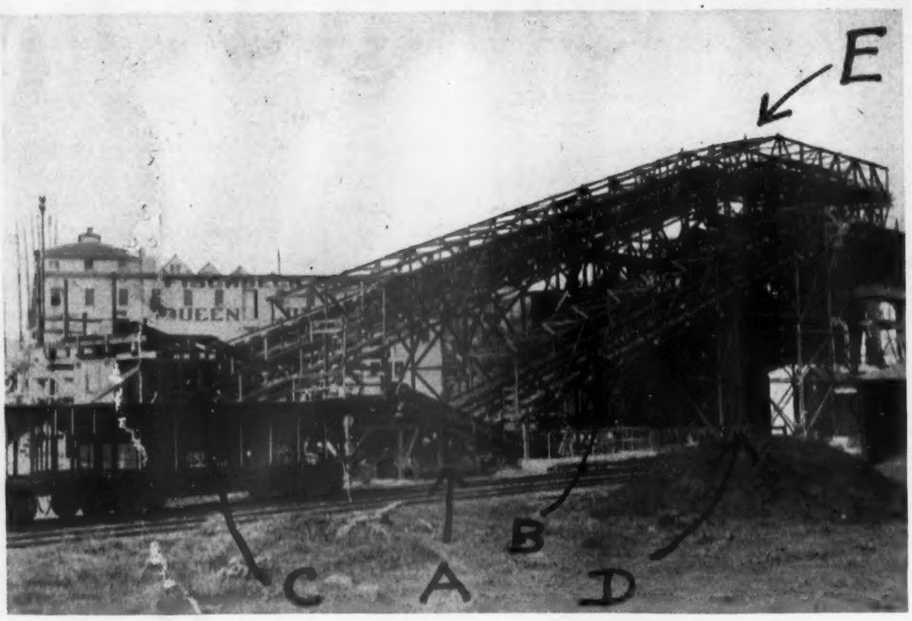
The concrete mixer has an air-operated discharge and the material is permitted to flow into a batch receiving hopper. The hopper also has an air-operated gate. The delivery trucks are equipped with Davis "Non-Tilt" bodies. They are driven under the hopper and the load taken on. Loads for individual jobs are designated by number, and as they are put through the mixer and placed in the receiving hopper the job number is telephoned to the truck dispatcher.

In order to eliminate loss of time in loading, the receiving hopper from the mixer is in tandem, so that should there be a tie-up of trucks due to traffic conditions, the mixer can be continued in operation and have two complete loads in the receiving hoppers, one in the concrete mixer and a fourth weighed and ready to charge into the mixer.

The plant has a total capacity of 90 cu. yd.



Part of the fleet of agitator type delivery trucks; cement silos at upper left and aggregate storage bunkers at right



The aggregates are handled from a track hopper at D on conveyors A and B to storage bunkers, from which they are carried to the mixing plant by conveyors C and E

per hr., and is so designed and arranged that this capacity can be doubled through the provision that has been made to install duplicate machinery throughout.

The company operates twelve Davis non-tilt agitator trucks, built by Norris K. Davis, Inc.

The plant is so arranged that the material after it has been weighed over the mixer can be deflected through a special gate in the mixer hopper for dry batching or mixer trucks. This is, however, an emergency measure.

Wisconsin State Public Works Put on 30-Hour Week

ALL PUBLIC WORKS under supervision of state departments of Wisconsin will be constructed on a five-day week and six-hour day basis, according to announcement by the State Unemployment Commission.

This rule will apply not only to highway work financed by federal funds, but to all construction work paid for by state funds, whether under contract or by day labor, it was stated.

It was further provided that work will be given to bona fide residents of Wisconsin and emergency employment will be staggered so as to give work to as large a number as possible.

The commission stated that action taken is in conformity with the general policy followed during the past 16 months in the conduct of public works under its direction.

It was determined at the outset, the commission said, that the best way to increase the employment of labor on public works construction is to perform the maximum amount of such labor by hand rather than by machine, and in contracts awarded by the commission this policy has been followed.

Consider Compromise in Dredging Litigation

THE HUNTINGTON, N. Y., town board has referred to its counsel a compromise offer by the Metropolitan Sand and Gravel Co., New York City, to settle litigation between the town of Huntington and the village of Asharoken, on one side, and the sand and gravel company on the other side.

Dredging operations were started several years ago by the Metropolitan company at Asharoken Beach. Court proceedings were started by the town and village to stop the operations. The present offer is a development of the litigation already under way or contemplated.

Action was brought by the village against the sand and gravel company, on the theory the breakwater of the company interfered with the accretion of sand along the Sound side of the beach, resulting from a sand drift from east to west. The court found such a sand drift existed, but held owners of property were not entitled to this sand drift. An appeal by the village of Asharoken is still pending.

The town of Huntington has brought an action to enjoin sand and gravel operations on the same property. This action has not come to trial.

The Metropolitan Sand and Gravel Co. has agreed to preserve the hillside and its large trees along the westerly boundary of its property facing the village of Asharoken and to preserve a strip at least 200 ft. wide along its entire southerly boundary. By this plan, it is said, the village may plant trees which in time will form an effectual screen for those entering or leaving the village.

The agreement is conditioned upon the village discontinuing its appeal and the town of Huntington discontinuing its action.—*New York* (N. Y.) *Times.*

Plans Development of Feldspar and Cyanite

LARGE DEPOSITS of feldspar and cyanite, located near the plant of the Alarka Lumber Co. at Alarka, N. C., are to be developed and mined, Arthur Brooks, president of the company, has announced. The deposits are reported by the company to be large and very valuable.

Officials of the company are now making plans to build a reduction plant to work the cyanite, which is present in large quantities. Already enough veins of both minerals have been opened to keep a large number of men employed for a considerable time, according to Mr. Brooks. Work will begin soon.

In announcing the plans of the company Mr. Brooks said:

"We have decided to change from the lumber business to the development of feldspar and cyanite. Under present conditions, it is our opinion that a plant can be built and machinery installed for less than other grinding plants in the state cost.

"Because of the fact that the company will have a much smaller investment in its plant than any of its competitors, the accessibility of the deposits, and the fact that low transportation costs are available, the mining can be conducted at a cost much below the average. The company expects to place ground feldspar upon the market at a price to compete with the output of mills already operating and to market the product with a fair margin of profit.

Members of the Alarka company are Mr. Brooks, president; J. E. Coburn, vice-president; Allan Brooks, Mason Brooks and M. C. Close.—*Asheville* (N. C.) *Citizen.*

Huron Cement to Have Lake Ontario Distributing Plant

OSWEGO, N. Y., will be made the Eastern distributing point for the Huron Portland Cement Co. of Detroit, Mich., and construction will be started immediately on a plant to handle the product, the *Syracuse* (N. Y.) *Herald* states. A vessel of the company, the *John W. Boardman*, will bring 8000 tons of bulk cement to Oswego soon.

The plant will have a loading elevator with a capacity of 60 cu. yd. of cement an hour, a storage bin holding 223 bbl. of cement from which cars may be loaded; also other equipment, including bins, sacking machines, scales and elevators.

To make the pier accessible to the big freighters which will bring the cement from the company's plant, a contract has been awarded to the Great Lakes Dredge and Dock Co. to start work immediately in clearing a channel 100 ft. wide.

The company expects to develop markets in northern New York and Vermont and will also distribute the cement by way of the Barge Canal. If business conditions are favorable the company will erect a large storage plant.

Cement Prices Continue Upward

LEADING PORTLAND CEMENT producers have advanced the price of their product by from 19c. to 29c. a barrel in the eastern territory, with the exception of the metropolitan New York district. The price in the metropolitan district was not increased because of competition due to European imports.

The advance was first announced by Lehigh Portland Cement Co. and was quickly followed by other important manufacturers, including International, Alpha, Pennsylvania-Dixie, and Universal-Atlas.

The new prices represent the first advance in this territory since early in 1929.

A week or so ago producers in the Middle West increased their prices by from 30c. to 50c. a barrel.

Up to the current increase there had been no important changes in price of cement since May, 1931, when the lowest point in 15 years was reached. That price represented the culmination of two years of intensive price cutting due to declining demand and sharp competition as a result of overproduction here and shipments from abroad. In the initial five months of 1931 alone five reductions were made, causing quotations in New York City and Chicago to decline by 40c. and 46c. a barrel respectively. In Albany the decline was 50c. a barrel.

While an advance of 19c. to 29c. a barrel ordinarily would be termed substantial, under present conditions it is only moderate. During recent months the great majority of cement manufacturers have been running in the red. Although it is unlikely that the current price increase will completely remedy this condition, it at least paves the way for better results when demand picks up.

Operations of the cement industry have been running at the lowest point in years. During June operations were 35.7% to capacity as compared with 65.4% in the similar month a year ago. For the 12 months ended with June, operations averaged 36.5%, in contrast to 55.2% in the preceding corresponding period.

Shipments during recent months have been running considerably above production. This has had the effect of bringing stocks on hand on June 30 last to the lowest point since the close of last November.

For the seven months ended with June, production totaled 34,156,000 bbl. as compared with shipments of 34,304,000 bbl. Stocks on hand on June 30 aggregated 24,051,000 bbl.

Foreign competition in the large seaboard cities continues to exert a most unfavorable effect on prices. While these importations are small in the aggregate as compared with the country's total consumption, they assume importance when dumped into a restricted area, and compel the local manufacturer to meet the foreign price or withdraw from the market and attempt to dispose of his product in other markets already well supplied.

During the first five months of the current year 185,869 bbl. of cement were received from abroad. In June, imports totaled 9223 bbl., the lowest monthly total so far this year. The high was reached in February with 83,706 bbl., while April followed with 59,392 bbl. Of April's total, 75%, or 44,670 bbl., was landed in New York from the United Kingdom, while of February's aggregate, 57%, or 48,287 bbl., came to New York from a like source.

Manufacturers of portland cement in the Birmingham district have advanced the price 40c. a barrel. The district has six mills. One is in full operation, two are on partial schedule, and three are down. Road building programs give promise of considerably accelerating the demand for cement.—*Wall Street Journal* (New York City).

Introduces Transit Equipment in England

"TRANSIT" concrete mixing equipment is being introduced in England and a plant has been opened in Bristol to supply the demands, a recent issue of *Industrial Britain* reports.

Fire Damages Office of Nashville Sand Producer

A FIRE of unknown origin nearly destroyed the office and an adjacent warehouse of the Cumberland River Sand Co., Nashville, Tenn., on the night of July 28. The flames started at about [illegible] o'clock in the morning and did considerable damage to the office. The plant was not touched by the fire. R. N. Coolidge, general manager of the company, estimated the loss to be about $18,000, largely covered by insurance. Rebuilding will be started shortly.

Besides the loss to the sand company the fire also destroyed the building of the Nashville Builders Supply Co., manufacturers of concrete products. Most of the machinery in the plant can be salvaged, but the building was a complete loss. H. E. Richardson of the products company estimated the loss at about $4000.

Building New Crushing Plant in New York State

THE Amsterdam Stone Crushing Co. of Amsterdam, N. Y., has leased for several years a tract of land on the Mrs. Henry H. Wood farm, near Whitehall. The concern has started construction of sundry buildings on the property. Approximately 30 men will be employed at the stone plant. —*Albany* (N. Y.) *Press*.

Concrete Paving Yardage

CONCRETE PAVEMENT yardage as awarded in the United States during July and for the period ending July 30, as reported by the Portland Cement Association, follow:

	Yardage awarded during July, 1932	Total yardage awarded to July 30, 1932
Roads	6,230,246	46,670,217
Streets	995,818	4,657,941
Alleys	10,200	208,073
Total	7,236,264	51,536,231

RETAIL MATERIAL PRICES, DELIVERED, JULY 1, 1932 (COMPILED BY DEPARTMENT OF COMMERCE)

City	Portland cement, per bbl. exclu. of cont.	Gypsum wallboard, 3/8-in., per M	Hydrated lime, per ton	Building sand, per cu. yd.	Crushed stone, 3/4-in., per ton	Gypsum plaster, neat, per ton
New Haven, Conn.	$2.40	....	$25.00	$1.25	$2.00	....
New London, Conn.	2.05	$25.00	18.00	1.50	3.00	$18.00
Waterbury, Conn.	2.60	30.00	18.00	1.00	2.45	18.00
Haverhill, Mass.	2.40	25.00	16.00	......	......	19.00
New Bedford, Mass.	2.40	25.00	16.00	1.25	2.50	16.00
Albany, N. Y.	2.34	23.85	15.75	......	......	16.20
Buffalo, N. Y.	2.95	21.00	18.00	2.50	2.05	16.00
Poughkeepsie, N. Y.	2.00	....	18.00	1.25	2.20	....
Rochester, N. Y.	2.28	22.00	14.50	2.00	2.40	16.00
Paterson, N. J.	2.00	24.00	18.00	1.50	2.10	17.50
Trenton, N. J.	2.10	29.00	13.50	1.60	1.50	15.50
Philadelphia, Penn.	2.00	....	13.00	1.75	2.60	16.50
Scranton, Penn.	2.40	30.00	18.00	3.38	......	18.00
Baltimore, Md.	2.10	25.00	13.00	1.85	2.50	15.50
Washington, D. C.	1.75	25.00	12.00	......	......	15.00
Richmond, Va.	2.80	38.00	15.75	2.23	2.10	18.00
Fairmont, W. Va.	2.50	35.00	16.00	2.60	3.25	18.00
Columbia, Tenn.	2.25	35.00	10.00	1.38	2.75	16.50
Atlanta, Ga.	2.55	36.00	15.50	2.81	2.50	20.15
Tampa, Fla.	2.40	50.00	24.00	2.00	2.40	25.00
New Orleans, La.	2.35	37.20	14.00	1.85	......	18.00
Akron, Ohio	1.81	40.00	14.00	1.50	1.55	15.50

City	Portland cement, per bbl. exclu. of cont.	Gypsum wallboard, 3/8-in. per M.	Hydrated lime, per ton	Building sand, per cu. yd.	Crushed stone, 3/4-in., per ton	Gypsum plaster, neat, per ton
Cincinnati, Ohio	$2.40	$25.00	$14.00	$2.36	$2.00	....
Cleveland, Ohio	1.80	21.00	12.00	2.03	2.20	18.00
Columbus, Ohio	2.00	....	14.00	1.22	......	16.00
Toledo, Ohio	1.40	20.00	12.00	1.40	1.60	14.00
Lansing, Mich.	2.25	....	20.00	1.80	1.80	17.50
Saginaw, Mich.	1.90	20.00	16.00	2.50	2.20	17.50
Terre Haute, Ind.	2.00	28.00	18.00	1.25	3.00	18.00
Louisville, Ky.	1.86	....	15.00	2.00	2.15	17.00
Milwaukee, Wis.	1.48	22.00	14.00	1.25	1.25	15.20
Des Moines, Iowa	1.82	23.50	18.00	1.40	......	14.00
Kansas City, Mo.	2.20	25.00	22.00	1.62	1.88	17.00
St. Paul, Minn.	2.10	23.00	19.00	1.25	1.75	17.00
Grand Forks, N. D.	3.00	....	25.00	2.60	......	20.00
Sioux Falls, S. D.	2.00	22.00	20.00	1.25	1.75	15.50
Wichita, Kans.	2.15	25.00	22.50	1.00	......	15.50
Tulsa, Okla.	2.40	30.00	20.00	1.00	1.50	16.00
San Antonio, Tex.	2.41	39.00	20.00	1.85	1.85	18.15
Tucson, Ariz.	3.49	40.00	28.00	1.25	2.25	17.10
Los Angeles, Calif.	2.30	23.50	24.70	1.25	1.40	15.20
San Francisco, Calif.	2.45	45.00	21.00	[illegible].40	1.60	16.30
Seattle, Wash.	2.70	....	....	......	......	....

New Machinery and Equipment

A New Air Classifier

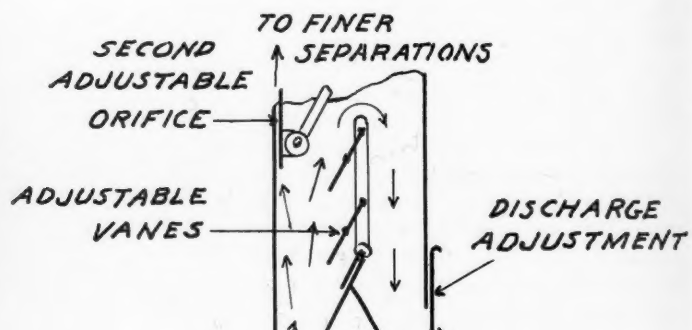
By Edmund Shaw
Contributing Editor, Rock Products

RECENTLY the writer was privileged to study the performance of an air classifier which practically opens a new field for the treatment of crushed and pulverized mineral substances. The Adams-Roalfe classifier, as it is called from its inventor, differs from other devices that use air as a separating medium in the wide range of products that it can make. The ordinary air separators rarely attempt to separate material coarser than 60-mesh, although in some instances separations as coarse as 30-mesh have been made commercially. But this passes the accepted limits for such machines. The Adams-Roalfe classifier, on the other hand, can make separations through the entire range ascribed to water classifiers; that is, from the finest silts to ⅛-in. or even ¼-in. diameter materials. On light materials it

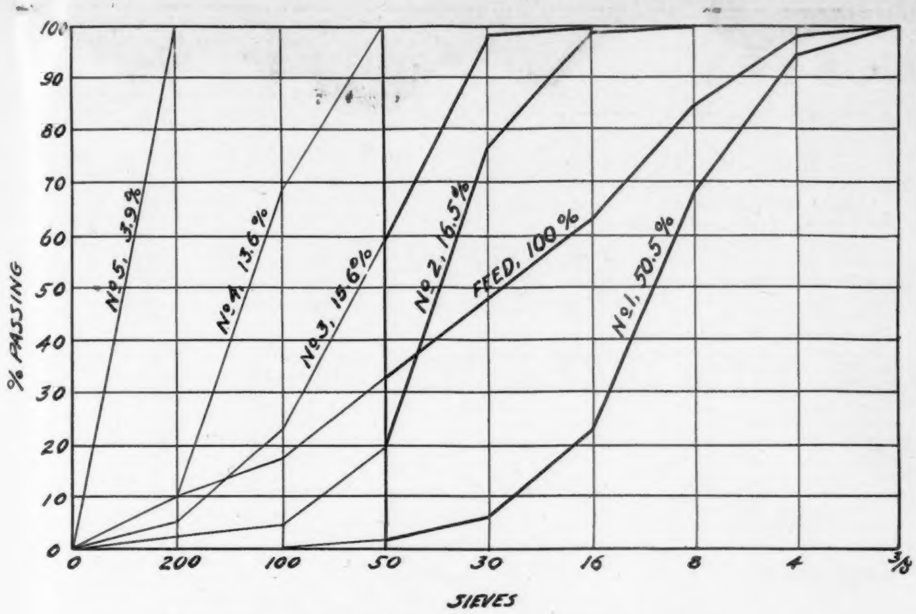
TABLE I—RESULTS OF TESTS ON CRUSHED QUICKLIME

	Sample	No. 1	No. 2	No. 3	No. 4	No. 5
	100%	50.5%	16.5%	15.6%	13.6%	3.9%
Passing ⅜-in.	100%	100%	....	....	....	....
Passing No. 4	98%	95%	....	....	....	....
Passing No. 8	85%	69.0%	100.0%	....	....	....
Passing No. 16	63%	23.0%	98.0%	100.0%	....	....
Passing No. 30	49%	6.0%	77.0%	98.0%	....	....
Passing No. 50	33%	1.3%	20.0%	61.0%	100.0%	....
Passing No. 100	18%	0.3%	4.3%	22.0%	69.0%	....
Passing No. 200	10%	....	2.2%	5.3%	10.0%	100.0%

Separates 6 to 3 tons per hour of ordinary specific gravity



Flow of materials through air classifier



Separations made by classifier as given in Table I

can work to much greater diameters. For example, it has already been used to separate lima beans from lumps of hard clay, lifting the beans with an air current.

This then is something quite new to the rock products industry—a machine that will not only remove dusts and the finer sands, but one to separate such coarse materials that it may be used as an *alternative for screening*. It is not expected that it is going to supercede screening in every instance, as there are certain advantages to screening and screened products which other separating devices cannot claim. On the other hand, in the fields of difficult screening another process may have all the advantage even in the range of screening sizes.

An example is found in the work of the Adams-Roalfe classifier on crushed quicklime. This material has been considered one of the most difficult of all mineral materials to screen. Yet a recent test with the classifier showed a practically complete removal of the desired fines in a single pass. The material was lump lime crushed by hand to approximate what the first break in a coffee mill type of grinder or similar device might produce. It was then classified in the machine with the results given in Table I.

The writer considers this to be a typical example of good classification. No. 1 and No. 2 products contain all the coarse and a very little of the fine, which in this case is minus 50-mesh. No. 3 is divided half and half between the fine and the coarse and No. 4 and No. 5 are wholly of the minus 50-mesh, which it is desired to save. In practice No. 1 and No. 2 would be sent back to the mill and No. 3 would probably be returned to the classifier without going to the mill. In this way it would hold the fine and coarse apart so that one could not contaminate the other. No. 4 and No. 5 would be the finished product, 100% minus 50-mesh, and they contain 82% of the feed to the classifier.

Equally good results have been obtained with cement raw material and clinker. Unfortunately the actual figures are not available for publication at this time.

The machine is simple, although the picture and the drawing may look somewhat complicated. The long square tube at the left of the photo is the actual classifier, the apparatus at the left being the cyclones in which the finished products are caught. The air from the fan enters near the bottom of this square tube and goes up an "adjustable orifice." This is really a flat tube that may be made wider and narrower by the lever motion shown in the section. The lighter particles of the feed are blown up and the heavier fall through, the feed coming from above. Over the orifice is a series of adjustable vanes that project into the air current. These help the separation by holding back the heavier particles. The finer particles go up to further separation in a second adjustable orifice, while the particles that are not heavy enough to fall through the first orifice go over the vanes and fall through the gate marked discharge adjustment. They are caught in a cyclone and form one of the numbered products. The particle sizes in this discharge may be varied readily by opening and closing the discharge adjustment gate, and, as the chart shows, the finer classified products are held within narrow limits. The separation of the finer sizes is made at other adjustable orifices above, the finest material being caught in a cloth filter.

The principle of the machine is that of the hindered settling classifier used for hydraulic separation. In fact, a small classifier of this kind has been run with water instead of air and found to work just as well.

An unusual feature is the very small amount of power required. This is because the air is working in a narrow space and there is no large body of air to be kept in circulation by a fan. The motor for driving the fan is only 1 hp. and a 1/4 hp. motor is required to drive the feeder and a beater which mixes the incoming feed thoroughly with air. The machine in the photo is full sized and has a capacity of from 6 to 8 tons per hour, separating materials of ordinary specific gravity and fineness.

Welding Heads

A NEW SERIES of welding heads with detachable tips has been introduced by the Linde Air Products Co., New York, N. Y., for use with the Oxweld type W-17 welding blowpipe. These will supplement the one-piece style heads for this blowpipe, so that the user will have a choice of two types of welding heads.

The new detachable tip heads were developed particularly for pipe line welding and for production operations. The new tip produces the same type of flame as that produced by the one-piece welding head for the type W-17 blowpipe, the manufacturer states. Sizes Nos. 6 to 13, inclusive, are available in the new welding heads.

One of the practical features claimed for the new design is the connection between the tip and the stem provided by the male thread on the tip which screws into the stem. Removal or replacement of the welding tip is thus facilitated.

General Purpose Photoelectric Relay

A GENERAL PURPOSE photoelectric relay with several new and important features has been developed by the General Electric Co., Schenectady, N. Y. This relay provides more sensitive control than the models which it supersedes and at the same time will permit operation at a minimum light intensity of three foot-candles, the manufacturer states. Other features offered by the new relay include improved dielectric strength, and an improved phototube housing with a cast aluminum base and a drawn aluminum hood.

Because of its many improvements and refinements, the relay affords an even wider range of applications than its predecessors.

Hydraulic Bulldozer

THE Laplant-Choate Manufacturing Co., Inc., of Cedar Rapids, Ia., announces a new hydraulic "Roadbuilder" for use on the "Caterpillar" Thirty-five tractor.

The blade is 9 ft. 4 in. long and is completely oscillating with adjustments provided so that either end can be locked into any position desired. The blade will oscillate up or down 16 in. at either end.

An all-steel removable cutting bit is provided at each end of the blade. The blade can be set at an angle for backfilling or sidehill cutting work, or it can be set straight across for bulldozing work.

THE INDUSTRY

Incorporations

Two Mountains Sand Co., Ltd., Montreal, Que., Can., $2,500.

Eagle Creek Gravel Co., Wall St. Road and Eagle Creek, Indianapolis, Ind.

Asbestos and Roofing Co., Inc., Dallas, Tex., $10,000. S. Y. Guthrie, and W. W. Fuller.

Devac Sand Co., 827 Remsen Ave., Brooklyn, N. Y. Joseph E. DiFiore and Anthony F. Vachris.

Joyce Supply Co., Patchogue, N. Y., 50 shares common. F. W. Tuck, Jr. To produce building materials.

Falls Road Stone Quarry, Inc., 2701 Falls Road, Baltimore, Md. John M. Hammond and Lawrence R. Collins.

Dan Murtland, Inc., Atlantic City, N. J., 2,500 shares common. To produce portland cement and limestone.

Greene County Crushed Stone Co., Catskill, N. Y., 100 shares common. To produce marble and slate.

American Building Material Co., Inc., Jersey City, N. J., 100 shares common. Louis Maio, Jersey City.

Greenfield Quarries Co., Greenfield, Ohio, 250 shares of no par value. James B. O'Donnell, Albert D. Cash and George E. Fee.

Art Cast Products, Inc., 26th Pl. and California Ave., Chicago, Ill., 200 shares of no par value. Glenn L. Heffner, L. D. Zelus and George Roes.

Southern Gravel and Sand Co., McRae, Ga., $20,000. E. C. Hosford and Herbert McRanie of Eastman, Ga., and W. W. Simmons of McRae, Ga.

Mapleside Concrete and Construction Co., Cleveland, Ohio, 100 shares of no par value. Lucille Pesano, Nettie Velotta, and B. H. Schwartz, Guardian Bldg., Cleveland.

Centrifugal Concrete Post Company, 102 N. Broadway, Urbana, Ill., 4,000 shares of no par value. C. R., Louis K., and W. A. Nichols, First National Bank Bldg., Urbana. To produce concrete products.

Badger Colorcrete Co., St. Croix Falls, Wis., $10,000 or 200 shares at $50 each. Geo. B., Clara A., and Edna Geideman, all of St. Croix Falls, and M. J. McDonald, Balsam Lake, Wis. To manufacture and deal in colorcrete vases, urns and garden furniture.

Quarries

Smith Stone Quarry near Portland, Ind., had its crusher building destroyed by fire on July 25.

Cincinnati Quarries Co., Cincinnati, Ohio, recently purchased a locomotive for its quarry at Greenville.

Pacific Limestone Products Co., Santa Cruz, Calif., reports that business has been the best in June in the history of the company.

Florida Trap Rock Products Co., Zephyrhills, Fla., is progressing with the construction of its plant buildings and work on a railroad spur is expected to start soon.

L and M Stone Co., Utica, N. Y., report a good volume of sales in the territory it serves. New equipment has been added to enable the company to supply a wider range of sizes of stone.

Sand and Gravel

Ed. J. Eversman opened a gravel plant at Spring Grove, Ia., recently.

Gary Sand Co. has changed its resident agent at Hammond, Ind., to C. F. Burrows.

Harry Spohn and **Oscar Kessler** have opened a gravel pit near Bremen, Ohio, and have contracts to supply material on state roads.

Grand Rapids Gravel Co. has leased the Crescent Gravel plant at Hersey, Mich., which has been idle since 1930 and operations have been started.

Iron City Sand and Gravel Co., Pittsburgh, Penn., recently chartered its steamer *Steel City* to the Campbell Transportation Co. of Pittsburgh for one year.

Port Washington, N. Y. Efforts of the city to include three sand companies in the corporate limits are being opposed, it is reported. It has been said that the sand companies plan to form a separate corporate village.

Cement

Lehigh Portland Cement Co. opened its Mitchell, Ind., plant on July 18.

North American Cement Corp. reopened its Catskill, N. Y., plant, August 1.

Spokane Portland Cement Co. resumed operation at its Irvin, Wash., plant August 1.

Yosemite Portland Cement Co., Merced, Calif., resumed operation of its plant on August 1.

Wabash Portland Cement Co. closed its Stroh, Ind., plant on July 16. Shipments will be made from stock.

Southwestern Portland Cement Co., reopened its Victorville, Calif., plant early in August and is to operate at 50% capacity.

Columbia Cement Division of the Pittsburgh Plate Glass Co., is now making regular shipments of cement by water from its Fultonham plant.

McCrady-Rodgers Co., Pittsburgh, Penn., announces the completion of the conversion of two deck barges into cement carriers to be used in transporting cement to the Montgomery locks, below Pittsburgh, now under construction. Two other barges are now being converted.

Gypsum

Pacific Portland Cement Co. recently shipped 10 carloads of gypsum to the government cement plant at Cebu, P. I.

Structural Gypsum Corp. and **Zenitherm Co.**, a subsidiary, have placed their advertising with the Hazard Advertising Corp., New York.

Other Rock Products

George A. Reynolds was recently in Mohave, Calif., to select a site for a plant at the Calsilico silica deposit in Last Chance Canyon.

Wm. H. Parsons, New York engineer, recently reported that he expects to reopen a large quarry at Bridgeport, Conn., to produce silica, mica and feldspar.

Personals

Elmer Palmer has been appointed manager of the South Edmeston, N. Y., plant of the Unadilla Sand and Gravel Co.

T. E. Cocker, Buffalo, N. Y., has recently been appointed by the Dings Magnetic Separator Co. of Milwaukee, Wis., as district manager for the Dings line.

L. A. Graham

L. A. Graham and **M. A. Carpenter** have been appointed sales manager and sales promotional manager respectively for all commercial products of the Falk Corp., Milwaukee, Wis. Foundry sales remain under the direction of A. Simonson, vice-president. Mr. Graham has been vice-president of the Low-Graham-Wallis Co., Inc., of Chicago, technical advertising agency, and sales manager of the Garford Truck Co., Lima, Ohio. Most recently he has been engaged in consulting sales work for the Falk Corp. and other engineering manufacturers in Milwaukee. M. A. Carpenter has for a number of years been in charge of all advertising activities for the Falk Corp. as well as the sale of certain of the Falk products.

Ralph L. Dunckel, formerly with the International Motor Co., has been placed in charge of production and purchasing at the Bridgeport plant by the Kron Co., Bridgeport, Conn. J. D. Young has become affiliated with the Chicago sales office.

H. O. Warner, general sales manager, Ideal Cement Co., Denver, Colo., is chairman of the cement and plaster committee of the Inter-Mountain Economic Conference to be held in Colorado Springs, September 1-3. The conference has been called for the creation of an inter-mountain consciousness for the coordination of inter-mountain business.

Manufacturers

Consolidated Products Co., Inc., announces the removal of its offices to the 20th floor, 15-19 Park Row, New York, N. Y.

Young Radiator Co., Racine, Wis., announces it is working a number of its departments overtime in preparation for the manufacture of new products.

Hercules Powder Co. is installing new boilers and modern equipment at its Kenvil, N. J., explosives plant. $135,000 has been appropriated for the project, which will proceed at once.

A. M. Castle and Co. has been appointed distributor of the Babcock and Wilcox Tube Co.'s products in the Chicago and Pacific Coast territories. A stock of Babcock and Wilcox boiler tubes and other classes of tubes will be warehoused.

Robins Conveying Belt Co., New York, N. Y., is opening a new sales office at Cleveland, Ohio, in charge of Robert Wisely; in Detroit, Mich., in charge of M. S. Lambert; in St. Louis, Mo., in charge of H. J. Martini; and at Charleston, W.Va., in charge of R. U. Jackson. These offices are in addition to the former branch offices maintained in Pittsburgh, Philadelphia, Boston and Chicago.

Materials Handling Institute, New York, N. Y., announces the winning slogan in its contest as "Move Materials Mechanically—at a Profit." C. P. Kreuzer of the planning department of General Electric Co. was winner. H. P. Hambright, who submitted a design for an Institute seal into which his slogan was incorporated, was given honorable mention. The winning slogan will be inserted into the slightly modified suggestion for a seal.

Diesel Engine Manufacturers' Association announces that H. Birchard Taylor of Philadelphia has been elected president, succeeding George W. Codrington of the Winton Engine Co. of Cleveland, who was elected chairman of the board. E. T. Fishwick of the Worthington Pump and Machinery Corp. continues as chairman of the executive committee. Mr. Taylor proposes to devote a considerable proportion of his time to the active management of this association.

The new president, Mr. Taylor, was graduated from the University of Pennsylvania in 1905. At the present time he is president of the General Alumni Society of the University of Pennsylvania and consulting engineer to the Baldwin Locomotive Works.

Austin-Western Road Machinery Co., domestic sales organization of the Austin Manufacturing Co. and the Western Wheeled Scraper Co., announces that it will handle the industrial sales and service of "Cletrac" crawler tractors in 24 states, broadly, the territory covered by the midwestern, southern and southeastern states. The present Cletrac organization continues to handle nationwide agricultural sales and industrial sales and service in that territory not covered by the Austin-Western Road Machinery Co.

Trade Literature

Road Grader Blades. Catalog gives price list on road grader equipment of all kinds. SHUNK MANUFACTURING CO., Bucyrus, Ohio.

Welded Construction. Bulletin 2 shows many types of equipment built of welded construction. LUKENWELD, INC., Coatesville, Penn.

Rubber. "A Wonder Book of Rubber" tells pictorial story of production and manufacture of many types of rubber goods. B. F. GOODRICH CO., Akron, Ohio.

Thrustors. GEA1262B describes G-E Thrustors for producing a straight line pressure thrust from a motor. GENERAL ELECTRIC CO., Schenectady, N. Y.

Bulk Cement Scales. Bulletin 5132 describes Richardson Duo-screw feed automatic scale for weighing bulk cement. RICHARDSON SCALE CO., Clifton, N. J.

Arc Welding Supplies. Section 3304 lists prices and gives specifications for arc welding equipment, supplies and accessories. LINCOLN ELECTRIC CO., Cleveland, Ohio.

Wire Rope. "The Splicing of Wire Rope" describes methods of splicing wire rope. Explanations are illustrated. JOHN A. ROEBLING'S SONS CO., Trenton, N. J.

Dust Collectors. Catalog 1391 describes different types of dust collection installations. Specifications for various types and models are included. BLAW-KNOX CO., Pittsburgh, Penn.

Air Compressors. Specification sheet L-621-B3 describes vertical and horizontal air compressors with feather valves. WORTHINGTON PUMP AND MACHINERY CORP., Harrison, N. J.

Rails and Track Equipment. Catalog lists and describes full line of track equipment. Specifications and detail drawings of parts are shown. L. B. FOSTER CO., Pittsburgh, Penn.

Self-Locking Screw Thread. Dardelet Bulletin No. 5, Third Edition, describes and illustrates Dardelet self-locking screw thread and various applications, strength tests, etc. DARDELET THREADLOCK CORP., New York, N. Y.

Multi-Speed Motor Drive. Leaflet L-20520 describes Westinghouse-Wise "Multi-Speed" drive, which consists of adjustable speed reducers built into a standard induction motor. Standard sizes range from ½ to 15 hp. WESTINGHOUSE ELECTRIC AND MANUFACTURING CO., East Pittsburgh, Penn.

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With which is Incorporated CEMENT and ENGINEERING NEWS — Founded 1896

Entered as second-class matter, July 2, 1907, at the Chicago, Ill., postoffice under the Act of March 3, 1879.

Contents for August 27, 1932

Departments

(Rock Products is indexed in the "Industrial Arts Index," which can be found in any Public Library)

TRADEPRESS PUBLISHING CORPORATION

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